



SOUTH PACIFIC

FIJI ISLANDS

From the Surveys of Captain H.M. Durnford, R.N. F.R.S. 1844-6
Lieut. Comdr. W. L. Hooper and G.E. Richards, R.N.
1870-82

and corrected from the *Atlas of Commodore C. Wilkes U.S.N.*
and various other authorities

1. Mean Sea Level for Survey is depth of ground of all depths of gray or mud on coast or over a rock or sand, in places of light
and depths are corrected to that datum

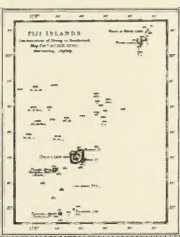
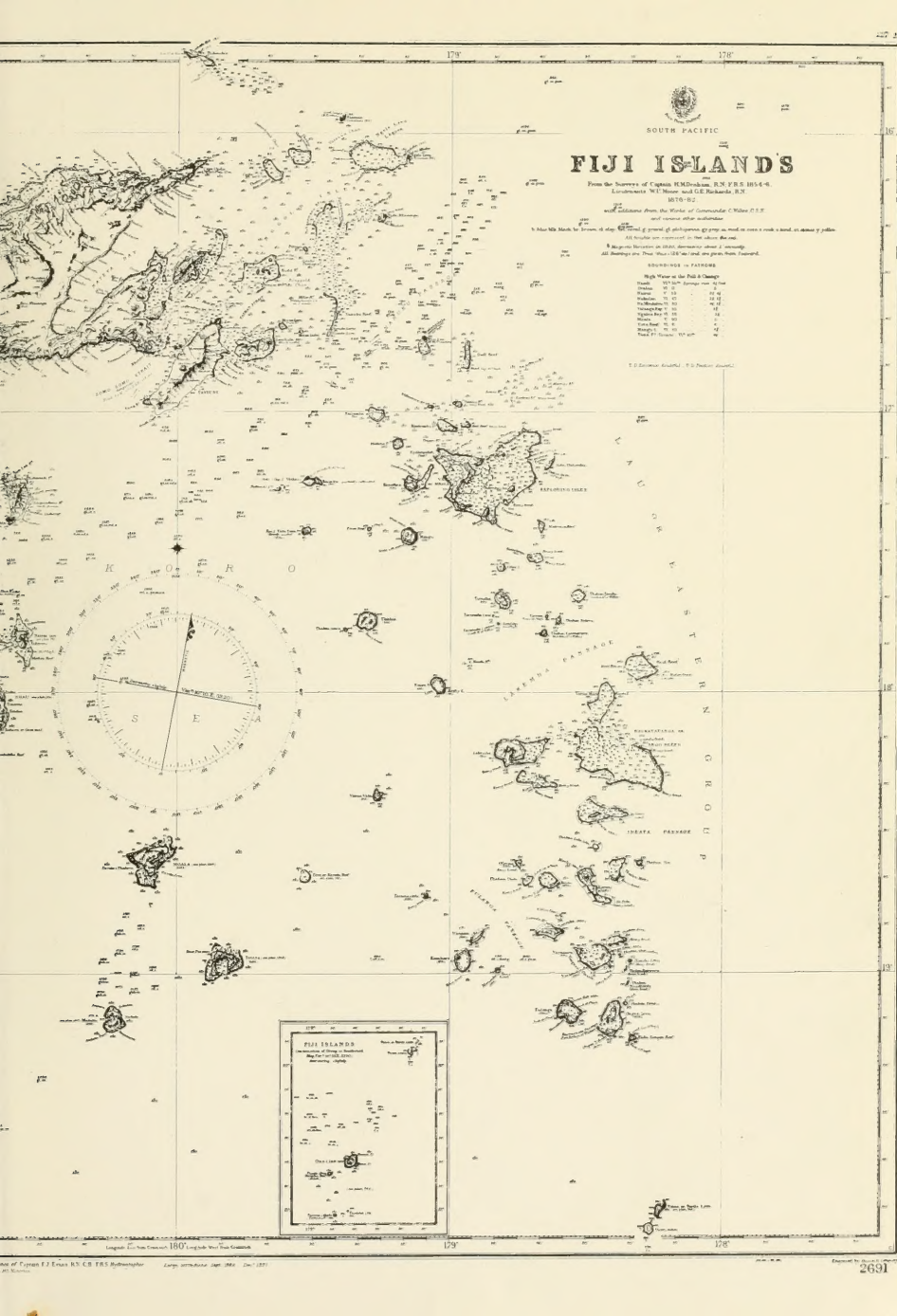
2. Magnetic Variation on 1880, determined about 2. easterly
and bearings are true, unless otherwise stated, and given from True North

RESOURCES OF FISHERY

High Water on the Full & Change

Jan.	1.55	1.55
Feb.	1.55	1.55
Mar.	1.55	1.55
Apr.	1.55	1.55
May	1.55	1.55
June	1.55	1.55
July	1.55	1.55
Aug.	1.55	1.55
Sept.	1.55	1.55
Oct.	1.55	1.55
Nov.	1.55	1.55
Dec.	1.55	1.55

1:50,000 Scale, 1:50,000 Scale



SOUTH PACIFIC

FIJI ISLANDS

From the Survey of Captain H.M. Holmes, R.N. 1814-6

Revised by W.H. Murray and G.E. Robinson, R.N.

1876-82

Information from the Works of Commodore C. Wake, R.N.

It is to be noted that the names of the islands and reefs are not uniform in all the publications of this office.

All bearings are true unless otherwise stated.

All bearings are true unless otherwise stated.

WINDS IN FATHOMS	
High Water on the Fall of Change	
Wind	10 to 12
Current	1/2 to 1
By the North	1/2 to 1
By the East	1/2 to 1
By the South	1/2 to 1
By the West	1/2 to 1
By the North-East	1/2 to 1
By the East-By-South	1/2 to 1
By the South-By-West	1/2 to 1
By the West-By-North	1/2 to 1
By the North-West	1/2 to 1
By the South-West	1/2 to 1
By the North-East	1/2 to 1
By the East-By-North	1/2 to 1
By the North-East	1/2 to 1
By the East-By-South	1/2 to 1
By the South-By-West	1/2 to 1
By the West-By-North	1/2 to 1
By the North-West	1/2 to 1
By the South-West	1/2 to 1
By the North-East	1/2 to 1
By the East-By-North	1/2 to 1
By the North-East	1/2 to 1
By the East-By-South	1/2 to 1
By the South-By-West	1/2 to 1
By the West-By-North	1/2 to 1
By the North-West	1/2 to 1
By the South-West	1/2 to 1
By the North-East	1/2 to 1
By the East-By-North	1/2 to 1

F. D. Southern, Admiralty, F. S. Anderson, Admiralty.



FIJI ISLANDS

Scale of the Chart is 1:100,000
 The distance between any two points on the chart is indicated by the number of miles shown on the scale.

Scale in miles 0 10 20 30

FLORA VITIENSIS NOVA

VOLUME 3

GK
473
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v. 3
Bot.

FLORA VITIENSIS NOVA
A NEW FLORA OF FIJI
(SPERMATOPHYTES ONLY)

ALBERT C. SMITH

VOLUME 3
Angiospermae: Dicotyledones, Families 117-163



Lawai, Kauai, Hawaii
1985



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INTRODUCTION

As in Volume 2 of this *Flora*, a few new names are here presented; for the convenience of compilers of indices of such names, they are here listed:

Caesalpiaceae: *Senna glanduligera* (comb. nov.)

Myrtaceae: *Syzygium dubium* (comb. et stat. nov.), *S. purpureum* (comb. et stat. nov.), *S. minus* (sp. nov.)

Combretaceae: *Terminalia psilantha* (sp. nov.)

Rutaceae: *Melicope seemannii* (comb. nov.), *M. cucullata* (comb. nov.), *M. cucullata* var. *robustior* (comb. nov.), *M. vitiensis* (comb. nov.), *M. vitiensis* var. *minor* (comb. nov.), *M. evansensis* (comb. nov.), *M. capillacea* (comb. nov.), *Sarcomelicope petiolaris* (comb. nov.)

Proteaceae: *Turrillia* (gen. nov.), *T. vitiensis* (comb. nov.), *T. ferruginea* (comb. nov.), *T. lutea* (comb. nov., New Hebrides), *T. papuana* (comb. nov., New Guinea), *T. bleasdalei* (comb. nov., Queensland).

A considerable number of pertinent books and journal articles have been produced since the publication of Volume 2 of the present *Flora*; some of these will be found mentioned in appropriate places throughout Volume 3, but perhaps others have been overlooked.

The "Sydney edition" (Voss et al., 1983)¹ of the *International Code of Botanical Nomenclature* (ICBN) does not differ substantially from the "Leningrad edition" of 1978, although a few paragraphs have unavoidably been given new numbers; these numbers will be used when such references are desirable. The only major alteration in the 1983 ICBN is the addition of the seemingly innocuous words "and species" to Art. 14.1. It remains to be seen what complications will thereby await plant taxonomists of the next century, in spite of the addition (Art. 14.2) of the ambiguous sentence: "Conservation of specific names is restricted to species of major economic importance."

The third and fourth volumes of the second edition of *Taxonomic Literature* (Stafleu & Cowan, 1981, 1983), covering authors whose family names begin with Lh-O (Vol. 3) and P-Sak (Vol. 4), are now available, as this invaluable compilation draws near its completion.

An important work entitled *An Integrated System of Classification of Flowering Plants* (Cronquist, 1981) will be often consulted and cited by plant taxonomists concerned with families, orders, and higher taxa. The book presents an updating of the philosophy propounded in Cronquist's *The Evolution and Classification of Flowering Plants* (1968), but it goes beyond the earlier work in its extraordinarily complete descriptions of the 384 families of flowering plants now accepted by its author.

Very useful outlines and indices of six recent major systems of angiosperm classification (including Cronquist's) have been compiled by Bedell and Reveal (1982).

In Volumes 1 and 2 of this *Flora* I mentioned the unsatisfactory nature of keys to the larger taxa (orders and families) of flowering plants. It is indeed premature to offer keys to orders, the satisfactory limits and relationships of which still require much future research. But a recently published key to the families of flowering plants in English (Geesink et al., 1981) goes far to fill the need for a usable artificial key to those

¹References indicated in this *Flora* by parenthetical dates, if not otherwise modified by an adjacent textual reference, are listed in Volume 1, pp. 84-88, in Volume 2, p. 3, and in the present volume, p. 2.

taxa. The work is a translation and amplification of the keys published in German by Franz Thonner (1863–1928), whose 1917 key is the basis of the greatly expanded new work by Geesink and his colleagues. A glossary and illustrations help to make the 1981 key readily usable by taxonomists and botanical students. The first step in the identification of a flowering plant—to discover its family—becomes entirely feasible by use of the new publication.

Throughout the present *Flora* I have attempted to typify or lectotypify each botanical name listed, believing that any floristic or monographic work is incomplete without such essential nomenclatural designations. Correct typification is no problem when the name is a recently proposed one, but to ascertain the typification of older names is often difficult, as Linnaeus and his contemporaries did not utilize the type method familiar to present-day botanists. To designate a lectotype for Linnaean species, when more than one element was included in the protologue, involves special expertise as well as access to early collections and pre-Linnaean publications. Many Linnaean taxa have indeed already been lectotypified by specialists, but to locate their decisions in the vast body of systematic literature is a major problem. Plant taxonomists have recently received a welcome announcement (Cannon et al., 1983) of an undertaking now being initiated at the British Museum (Natural History) and the Linnean Society of London to compile existing data on typifications of Linnaean names and then to study the remaining taxa and select lectotypes for them. This project will greatly clarify what has been a vexing problem for conscientious systematists.

William G. Ziarnik, a student at Columbia University, New York, made a small collection of plants in Fiji in 1984, with the cooperation of the University of the South Pacific. He has kindly permitted me to use one of his photographs in the present volume.

SUPPLEMENTARY REFERENCES

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DIVISION ANGIOSPERMAE (MAGNOLIOPHYTA) (continued)

CLASS DICOTYLEDONES (MAGNOLIATAE) (continued)

SUBCLASS ROSIDAE

The first ten families (numbered 117–126) here treated are among the many that the majority of recent phylogenists consider central to a broad “rosoid” concept, which in its entirety may be taken as a subclass (Takhtajan, 1980; Cronquist, 1981) or as a series of superorders (Thorne, 1976; Dahlgren, 1980). The ten families which have representatives in Fiji are of course too few to give much indication of the full variability of a basic rosoid alliance, and they are differently treated by various proposers of phylogenetic sequences.

Schulze-Menz (in Melchior, 1964) utilizes a broad concept of an order Rosales that accommodates all ten of the families. Hutchinson (1973) would place the ten families here considered in six orders, all but one of which occupy early positions in his “Lignosae.” Thorne (1976), in his superorder Rosiflorae with three orders, accepts nine of our families in the order Rosales, the tenth in an order Pittosporales. Dahlgren (1980) would include five of the families in his orders Cunoniales, Saxifragales, and Rosales (superorder Rosiflorae, composed of twelve orders), the remaining five in more advanced, derived superorders. Cronquist (1981) places seven of our families in his order Rosales, the other three composing the order Fabales.

In view of these diverse opinions of the contents and sequence of orders, I continue to follow Takhtajan (1980) and place our basic rosoid families in four orders, Saxifragales (with a total of 25 families), Rosales (with three families), Fabales (with the three subfamilies of legumes, here construed as families), and Connarales (with a single family). It may be noted that some current opinion indicates the Fabales and Connarales to be too advanced in many respects to be included in a basic rosoid complex; perhaps in future phylogenetic systems they will be considered more closely allied to a sapindalean complex.

The following key to the orders of Rosidae represented in Fiji is based on fairly superficial characters; it is largely adapted from Cronquist (1981) and is intended to aid in the placement of our families, not to indicate the full scope of the named orders.

KEY TO ORDERS OCCURRING IN FIJI

Flowers with separate (1–many) carpels, or with carpels united only toward base or by their styles, or with numerous ovules per carpel, or with numerous stamens; plants relatively primitive within the subclass, with one or more of the preceding listed characters; vascular bundles never with internal phloem; plants never parasitic.

Flowers actinomorphic (at least in all our taxa), hypogynous or rarely semi-epigynous, seldom slightly perigynous; carpels free or united (and then styles separate or simple); stipules present or absent.

SAXIFRAGALES (FAMILIES 117–120)

Flowers actinomorphic or zygomorphic; carpels usually free (or, if united, usually with separate styles or only 1 carpel fertile).

Carpels 1–many, the seeds usually without endosperm; stamens usually 2–many times more numerous than petals; flowers perigynous. ROSALES (FAMILIES 121, 122)

Carpels usually 1 or 5, free; stamens usually twice as many as petals; flowers hypogynous to somewhat perigynous.

Flowers usually zygomorphic (but sometimes actinomorphic); carpel solitary; ovules superposed (when more than 1); fruit a legume (1-celled and 2-valved) or indehiscent, sometimes winged, the seeds without (or rarely with scanty) endosperm; stipules usually present.

FABALES (FAMILIES 123-125)

Flowers actinomorphic; carpels usually 5 or 1; ovules 2, collateral; fruit composed of 1-5 1-seeded follicles, the seeds with endosperm copious to none; stipules lacking.

CONNARALES (FAMILY 126)

Flowers mostly syncarpous (infrequently with separate carpels; gynoecium consistently composed of a single carpel only in Proteales), or with only 1 or 2 ovules per carpel, or with comparatively few stamens (stamens usually not more than twice as many as sepals or petals, but in some included groups, i. e. Myrtales, numerous); plants relatively advanced within the subclass, with one or more of the preceding listed characters; vascular bundles sometimes with internal phloem; plants sometimes parasitic.

Vascular bundles with internal (as well as external) phloem; flowers strongly perigynous to epigynous, often with numerous stamens and numerous ovules. MYRTALES (FAMILIES 127-132)

Vascular bundles without internal phloem; flowers diverse but usually with comparatively few stamens and ovules.

Gynoecium obviously with more than 1 carpel, syncarpous (some exceptions to be noted in Families 135, 136, 137, 141).

Plants autotrophic; ovules apparent and with an integument.

Leaves mostly compound or conspicuously lobed or cleft, but sometimes unifoliolate or simple.

Ovary superior; pollen either binucleate or trinucleate when shed.

Plants usually woody.

Disk present; carpels not free (or, if free basally, joined above by styles); petals not enclosing carpels after anthesis to form a pseudodrupe; leaves usually alternate and compound (but sometimes opposite and/or simple).

Ovules epitropous (except in Family 133); flowers usually actinomorphic (rarely zygomorphic), the stamens not unilateral; disk intrastaminal, annular or often developed into a gynophore. RUTALES (FAMILIES 133-139)

Ovules anatropous (mostly solitary and ascending with the raphe ventral, epitropous when dependent); flowers often obliquely zygomorphic, the stamens usually 8, inserted within disk or unilateral; disk extrastaminal, sometimes unilateral.

SAPINDALES (FAMILY 140)

Disk lacking; stamens 10; carpels 5-10 (-12), free, the ovules solitary, pendulous, anatropous; petals keeled within, persistent, accrescent and closely subtending achenes to form a pseudodrupe; leaves simple, opposite. CORIARIALES (FAMILY 141)

Plants mostly herbaceous or nearly so (woody in *Averrhoa*, Family 142).

GERANIALES (FAMILIES 142, 143)

Ovary inferior; pollen trinucleate when shed. ARALIALES (FAMILIES 144, 145)

Leaves simple, entire or merely toothed (but usually compound in Families 153 and 154).

Ovary superior, sometimes partially or completely surrounded by disk or semi-inferior.

Flowers regular, strictly actinomorphic.

Stamens basally connate, usually more than 5; disk lacking or represented by inconspicuous glands; pollen trinucleate when shed. LINALES (FAMILY 146)

Stamens free from one another, seldom more than 5; disk often present.

Stamens alternate with petals or fewer or flowers rarely dispostemonous; pollen either binucleate or trinucleate when shed. CELASTRALES (FAMILIES 147-151)

Stamens opposite petals; pollen binucleate when shed.

RHAMNALES (FAMILIES 152-154)

Flowers irregular, at least slightly zygomorphic. POLYGALES (FAMILIES 155, 156)

Ovary inferior. CORNALES (FAMILY 157)

Plants mostly parasitic or hemiparasitic (but sometimes autotrophic); ovular reduction sometimes apparent in lack of an integument or absence of recognizable ovules.

Flowers usually ♂ (unisexual in Family 161); plants with chlorophyll.

SANTALALES (FAMILIES 158-161)

Flowers unisexual; plants without chlorophyll; fruits small, nutlike.

BALANOPHORALES (FAMILY 162)

Gynoecium composed of a single carpel developing into a basically follicular fruit; flowers hypogynous, 4-merous, monochlamydeous, the tepals commonly petaloid, the stamens 4, antetepalous; hypogynous glands usually present, borne within androecial whorl. PROTEALES (FAMILY 163)

ORDER SAXIFRAGALES

KEY TO FAMILIES OCCURRING IN FIJI

- Plants woody, the leaves not succulent; stamens essentially free; gynoecium usually syncarpous (but apocarpous in some Cunoniaceae).
- Stipules present; leaves compound or simple; flowers usually 4- or 5-merous, the petals present or absent, if present free and imbricate (in our genera), the stamens often twice as many as calyx lobes (in our taxa very rarely as many as and opposite calyx lobes); gynoecium (in our genera) either apocarpous or syncarpous and 2-carpellate, and then the ovary 2-locular and with axile or pendulous ovules, these often few (1-7, or in one of our genera as many as 42); fruit (in our genera) a follicetum or a septicidally dehiscent capsule or a drupe, the seeds often winged.
- Leaves opposite or whorled, simple or compound (if imparipinnately compound then in our representatives with not more than 9 (very rarely 13) leaflets); stinging hairs not present; stamens often exserted, the filaments straight; ovules apotropous or rarely epitropous; fruit (in our genera) a follicetum, a 2-valved capsule, or drupaceous (and probably tardily dehiscent); seeds with usually copious endosperm; our genera all with indigenous species. 117. CUNONIACEAE
- Leaves alternate, imparipinnately compound, with a roughly aculate rachis and usually 11 or 13 leaflets; stinging hairs present on branchlets, leaves, and inflorescences; stamens not exserted, the filaments sharply bent distally; ovules epitropous; fruit a drupe with 2 pyrenes; seeds without endosperm; cultivated only in Fiji. 118. DAVIDSONIACEAE
- Stipules absent; leaves alternate or pseudovercillate, simple; flowers usually 5-merous, the petals free or proximally connate (in our genus basally valvate and distally imbricate), the stamens as many as and opposite calyx lobes; gynoecium syncarpous, 2 (rarely 3-6)-carpellate, the ovary superior, in our genus 1-locular and with parietal placentas, the ovules numerous (in our taxa 22-50); fruit (in our genus) a loculicidally dehiscent capsule, the seeds with copious endosperm, in our genus not winged, embedded in viscid resin; our genus with indigenous species. 119. PITTOSPORACEAE
- Plants herbaceous (or shrubby) and usually with succulent stems and leaves; leaves (in our genus) opposite or whorled, simple to 5-foliolate, often with adventitious buds in marginal crenations; sepals and petals (in our genus) connate into tubes; stamens (in our genus) 8 (rarely 4), epipetalous; gynoecium apocarpous, the carpels free or basally connate; fruit a follicetum (in our genus enclosed by the marcescent calyx and corolla); seeds with fleshy and scant endosperm, rarely without endosperm; cultivated and naturalized in Fiji. 120. CRASSULACEAE

FAMILY 117. CUNONIACEAE

CUNONIACEAE R. Br. in Flinders, Voy. Terra Australis 2: 548. 1814.

Trees or shrubs, sometimes dioecious or polygamodioecious; stipules present, sometimes large, often united in pairs; leaves usually opposite, sometimes verticillate, simple (rarely 2-foliolate) or digitately 3- or 5-foliolate or imparipinnately compound, the leaf or leaflet blades pinnatinerved, often with axillary domatia beneath, often glandular-serrate; inflorescences axillary or terminal or borne on defoliate branchlets, racemose, paniculate, capitate, or rarely 1-flowered; flowers actinomorphic, usually small, ♂ or unisexual, the receptacle usually flat; calyx lobes usually 4 or 5 (less often 3 or 6, very rarely 7), sometimes shortly connate, imbricate or valvate, sometimes accrescent; petals present or absent, if present 3-5, free or basally connate, usually smaller than sepals, entire or toothed or 2- or 3-lobed, the lobes sometimes gland-tipped; disk annular or lobed, nectariferous; stamens 4-numerous, often twice as many as calyx lobes (sometimes as many as calyx lobes and opposite them), inserted at base of disk, the filaments free, the anthers short, 2-locular, longitudinally dehiscing; gynoecium 4- or 5-carpellate (rarely 3- or 6-carpellate) and apocarpous, or 3-5-carpellate and syncarpous, or commonly 2-carpellate with concrescent carpels, the ovary if syncarpous superior or rarely semi-inferior, the ovules anatropous, usually apotropous (epitropous in *Spiraeanthemum* and *Acsmithia*), 1-many, axile or pendulous in syncarpous ovaries, the styles free, the stigmas terminal, capitate; fruit usually a 2-valved capsule or a follicetum, rarely a drupe or nut, the seeds 1-many, sometimes winged, glabrous or pilose, the endosperm usually copious, the embryo small, straight.

DISTRIBUTION: Pantropical and warm temperate but mostly in the Southern Hemisphere, with a center in eastern Malesia and Australasia, with 21–26 genera and about 350 species. Five genera are represented in Fiji by indigenous species. Two genera occur in Samoa but apparently the family is absent from Tonga and Niue. Dickison (1980, cited below, p. 308) summarizes evidence suggesting that *Spiraeanthemum* and *Acsmithia* are to be considered the most primitive extant genera of the family.

USEFUL TREATMENTS OF FAMILY: SMITH, A. C. Studies of Pacific Island plants, XII. The Cunoniaceae of Fiji and Samoa. *J. Arnold Arb.* 33: 119–149. 1952. HOOGLAND, R. D. Studies in the Cunoniaceae. II. The genera *Caldcluvia*, *Pullea*, *Acsmithia*, and *Spiraeanthemum*. *Blumea* 25: 481–505. 1979. DICKISON, W. C. Comparative wood anatomy and evolution of the Cunoniaceae. *Allertonia* 2: 281–321. 1980 (listing previous studies of the family by the author and others).

KEY TO GENERA

- Gynoecium apocarpous, composed of 4 or 5 (rarely 3 or 6) free carpels, each with 1 or 2 (in our species) epitropous ovules; flowers small, apetalous, the calyx and filaments white to yellowish or greenish, the calyx lobes valvate, the disk lobulate with (3–) 4–12 lobes, the stamens (6–) 8–12; follicles ventrally dehiscent, the seeds winged at one or both ends; inflorescences paniculate, solitary; leaves simple.
- Plants dioecious (possibly rarely polygamodioecious); leaves opposite; stipule scars elongate, curved; ovules paired; seeds winged at both ends. 1. *Spiraeanthemum*
- Plants with ♂ flowers; leaves verticillate; stipule scars short, nearly straight; ovules solitary (in our species, but in some others 2 or 4, infrequently 3, 5, or 6); seeds with a distal wing only. 2. *Acsmithia*
- Gynoecium syncarpous, composed of 2 carpels, the ovules apotropous, 3 or more per ovary locule.
- Inflorescences basically racemose, the racemes solitary or 2–4 at apex of a short common peduncle or arising from inconspicuous glomerules; ovary superior, the carpels fused ventrally in the region of the ovary; fruit a septicidally 2-valved capsule; leaves compound or simple.
- Plants with ♂ flowers, these apetalous, large, the calyx and filaments red, the calyx lobes valvate; disk plicate, entire; stamens numerous (8–26 in our species), with comparatively long (11–20 mm. long in our species) filaments; ovules numerous (20–42 per locule in our species); seeds irregularly winged at both ends (or proximal wing reduced); leaves digitately 3- or 5-foliolate. 3. *Geissois*
- Plants with ♂ flowers or dioecious or polygamodioecious, the flowers small, the petals and filaments white or greenish, the calyx lobes imbricate; petals 4 or 5; disk divided into 8 or 10 free lobes; stamens 8 or 10, with short (up to 4 mm. long in our species) filaments; ovules comparatively few (3–6 per locule in our species); seeds comate at both ends (in our species), not winged; leaves simple (rarely 2-foliolate), 3-foliolate, or imparipinnately compound. 4. *Weinmannia*
- Inflorescences paniculate, paired or ternate (or quaternate) and superposed; flowers ♂, apetalous, the calyx and filaments white to yellowish or greenish, the calyx lobes narrowly imbricate; ovary semi-inferior or (as in our species) 1/3–1/4 inferior, the ovules 4 or 6 per locule, biseriate, pendulous; disk lobes 10 or 12, often coherent in pairs; stamens 10 or 12; fruit drupaceous (probably becoming a tardily dehiscent capsule not much altered from maturing gynoecium), the seeds with a proximal wing and a distal nucellus; leaves simple. 5. *Pullea*

1. *SPIRAEANTHEMUM* A. Gray in Proc. Amer. Acad. Arts 3: 128. May, 1854, Bot. U. S. Expl. Exped. 1: 666. June, 1854, in Ann. Sci. Nat. Bot. IV. 4: 176. 1855; Seem. Fl. Vit. 110. 1866; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 18a: 237. 1930; A. C. Sm. in J. Arnold Arb. 33: 139. 1952; Hutchinson, Gen. Fl. Pl. 2: 8. 1967; Hoogl. in *Blumea* 25: 501. 1979.

Dioecious (or possibly occasionally polygamodioecious) shrubs or trees; stipules ovate to lanceolate, caducous, leaving elongate, curved scars; leaves simple, opposite; inflorescences axillary or pseudoterminal, paniculate, solitary, with opposite or subopposite branches, often many-flowered, the flowers small, solitary on ultimate inflorescence branches or in fascicles, unisexual (or the ♀ flowers possibly sometimes with fertile anthers), the pedicels articulate (only portion above articulation strictly pedicellary), the calyx and filaments white to yellowish or greenish; calyx lobes 4 or 5, infrequently 3 or 6, valvate; petals absent; disk lobulate, the lobes in ♂ flowers (3–)

4-6, in ♀ flowers (6-) 8-12; stamens twice as many as calyx lobes, present but apparently sterile (possibly rarely fertile) in ♀ flowers, the anthers small, the ♂ flowers lacking vestigial carpels; ♀ flowers with 3-6 (usually 4) free carpels, the ovules 2, epitropous, collateral, pendulous, attached near middle or subapically, narrowed and winged at both ends; calyx and stamens (usually sterile) persistent in fruit; fruit a follicle (1 or more carpels sometimes aborted), the follicles ventrally dehiscent, with persistent styles, the seeds 2 (1 rarely aborted), subequally winged at both ends.

LECTOTYPE SPECIES: *Spiraeanthemum samoense* A. Gray (vide A. C. Smith in J. Arnold Arb. 33: 139. 1952), one of Gray's two original species, the second of which is now referred to *Acsmithia*.

DISTRIBUTION: New Britain, Solomon Islands, New Hebrides, Fiji, and Samoa, with six species, of which three are endemic in Fiji. The genus also seems to occur in the Milne Bay District of New Guinea, although this is not stated by Hoogland.

KEY TO SPECIES

Branchlets and petioles glabrous or distally evanescently strigose-puberulent; leaf blades glabrous on both surfaces (rarely sparsely puberulent on costa when young), lanceolate to elliptic- or oblong-ovate, 4-10 × 1.3-6 cm.

Leaf blades 5-10 × (2-) 2.5-6 cm., obtuse at base and abruptly decurrent on petiole, entire or inconspicuously serrulate at margin (teeth minute, 1 or 2 per centimeter, or obsolete); inflorescence peduncle (1-) 4-7 cm. long; filaments in ♂ flowers 2.5-3 mm. long. 1. *S. graeffei*

Leaf blades 4-8 × 1.3-3.8 cm., attenuate or acute at base and long-decurrent on petiole, conspicuously serrate at margin (teeth 3 or 4 per centimeter); inflorescence peduncle 2-4 cm. long; filaments in ♂ flowers 1.2-1.6 mm. long. 2. *S. serratum*

Branchlets and petioles copiously velutinous-puberulent with long-persistent hairs 0.1-0.15 mm. long; leaf blades persistently puberulent on costa and secondary nerves beneath, ovate to lanceolate- or ovate-elliptic, 4-14 × 1.5-8.5 cm., entire or inconspicuously denticulate at margin. 3. *S. kataka*

1. ***Spiraeanthemum graeffei*** Seem. Fl. Vit. 111. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 163, as *Spiraeanthemum g.* 1890; Gibbs in J. Linn. Soc. Bot. 39: 145. 1909; A. C. Sm. in J. Arnold Arb. 33: 141. 1952; J. W. Parham, Pl. Fiji Isl. 81. 1964, ed. 2. 122. 1972; Hoogl. in *Blumea* 25: 502. 1979. FIGURES 1A & B, 2A.

A tree or shrub 3-8 m. high, occurring at elevations of 275-1,050 m. in dense forest or on its edges; the calyx and filaments are white, the anthers yellow. Flowers have been obtained in scattered months between March and December, fruits only in September and October.

TIPIFICATION: Seemann cited only *Graeffe 16*, p. p., from Mt. Mbuke Levu, Kandavu. However, the K sheet of this, indicated as having been sent from Reichenbach's herbarium in April, 1865, is noted as from Viti Levu. Seemann also cited part of *Graeffe 16* from Viti Levu as representing *Spiraeanthemum vitiense* (i.e. *Acsmithia vitiensis*). Probably Hoogland in 1979 correctly cited the BM specimen as the holotype of *S. graeffei*, but I would amend this citation as: *Graeffe 16*, p. p. (BM HOLOTYPE; ISOTYPES at K, W; photos of K isotype at BISH, US), probably collected in 1862 or 1864 on Viti Levu, as suggested by the known occurrence of the species on Mt. Voma, which was probably visited by Graeffe.

DISTRIBUTION: Endemic to Fiji and thus far known with certainty only from Viti Levu. Hoogland in 1979 also mentioned Kandavu and Vanua Levu; the former is based on the probably erroneous type locality cited by Seemann, and I have found no records from Vanua Levu. *Spiraeanthemum graeffei* has been noted from Guadalcanal, Solomon Islands (by Dickison in Bot. J. Linn. Soc. 71: 292. 1975), but the specimen probably represents *S. macgillivrayi* subsp. *kajewskii* (Perry) Hoogl. (in *Blumea* 25: 504. 1979).

LOCAL NAMES: *Katakata* (used generically), *kutakuta*, *kutukutu*.

AVAILABLE COLLECTIONS: VITI LEVU: Mba: Nandende Levu, *DA 14060*; Koro-O radio station, west of Nandarivatu, *DA 13536*; Tholo-i-Nandarivatu ridge, *Gibbs 731*. NADRONGA & NAVOSA: Nausori Highlands, *DA 12563, 13391*. SERUA: Mt. Tikituru, *DA 14471*; Nathengathenga Creek, upper Navua River, *DF 975*. NAMOSI: Summit of Mt. Voma, *Gillespie 2728*. NAITASIRI: Northern portion of Rairaimatuku Plateau, between Mt. Tomanivi and Nasonggo, *Smith 5800*.

2. *Spiraeanthemum serratum* Gillespie in Bishop Mus. Bull. **83**: 11. *fig. 11*. 1931; A. C. Sm. in J. Arnold Arb. **33**: 143. 1952; J. W. Parham, Pl. Fiji Isl. **82**. 1964, ed. 2. 122. 1972; Hoogl. in *Blumea* **25**: 505. 1979. FIGURE 1C & D.

A small tree or shrub 3–5 m. high, found in dense thickets on crests and ridges at elevations of 1,100–1,323 m.; the calyx and filaments are greenish white. Flowers have been collected between October and February, mature fruits only in February.

TYPIFICATION: The type is *Gillespie 4107* (BISH HOLOTYPE; ISOTYPES at BISH, GH), collected Nov. 29, 1927, on the summit of Mt. Tomanivi, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and known only from Viti Levu and Taveuni.

AVAILABLE COLLECTIONS: VITI LEVU: Mba: Mt. Evans Range, *Greenwood 364, 457*; summit and upper slopes of Mt. Tomanivi, *Gillespie 4122.1, DA 7126, 13074, 14649, O. & I. Degener 32075*. NAMOSI: Korombasambasanga Range, *DA 2200*. TAVEUNI: Summit of Mt. Uluingalau, *Smith 891*.

Although *Spiraeanthemum serratum* is clearly a close relative of *S. graeffei*, the two taxa seem to merit specific recognition as noted in my key, the leaf blade margin being the most apparent distinguishing feature. *Spiraeanthemum serratum* is known only from a few of the highest Fijian ridges, while *S. graeffei* occurs on lower mountain slopes.

3. *Spiraeanthemum katakata* Seem. in A. Gray in *Bonplandia* **10**: 36, nom. nud. 1862, Viti, 437, nom. nud. 1862, Fl. Vit. 111. *t. 17*. 1866; Drake, Ill. Fl. Ins. Mar. Pac. **163**, as *Spiraeanthemum k.* 1890; Pampan. in *Ann. Bot. (Rome)* **2**: 51. 1905; Gibbs in J. Linn. Soc. Bot. **39**: 145. 1909; A. C. Sm. in J. Arnold Arb. **33**: 144. 1952; J. W. Parham, Pl. Fiji Isl. **82**. *fig. 33*. 1964, ed. 2. 122. *fig. 35*. 1972; Hoogl. in *Blumea* **25**: 503. *fig. 2*. 1979.

Spiranthemum (sic) *vitiense* sensu Seem. in *Bonplandia* **9**: 256. 1861; non A. Gray.

Spiraeanthemum samoense sensu Gibbs in J. Linn. Soc. Bot. **39**: 145. 1909; non A. Gray.

Spiraeanthemum parksii Gillespie in Bishop Mus. Bull. **83**: 10. *fig. 10*. 1931.

A tree or sometimes a gnarled, compact shrub, 3–15 m. high, occurring at elevations of 100–1,195 m. in dense or dry forest or on its edges, in the forest-grassland transition, in the forest and thickets of ridges, and sometimes in open places. The calyx, filaments, anthers, and styles are white or with a greenish tinge, the styles sometimes flushed with pink, and the mature fruits are usually dull pink. Flowers and fruits have been collected in most months.

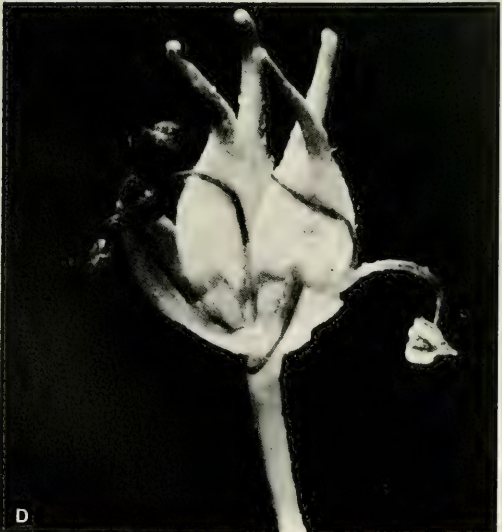
TYPIFICATION AND NOMENCLATURE: The only collection cited by Seemann was his no. 196, said to have been collected on Kandavu. However, some specimens of this number at K are indicated as being in part from Viti Levu and in part from Ovalau. It seems probable that the type material was taken from several plants, the localities of which cannot now be disentangled, and that the better citation is: *Seemann 196* (K HOLOTYPE; putative ISOTYPES at BM, GH; photos of K specimen at BISH, US), collected in 1860 in Namosi Province, Viti Levu, near Port Kinnaird, Ovalau, and perhaps on Kandavu.

The type of *Spiraeanthemum parksii* is *Parks 20725* (BISH HOLOTYPE; ISOTYPES at SUVA, US), collected in July, 1927, in the vicinity of Nandarivatu, Mba Province, Viti Levu. Gillespie indicated that his new species has thicker, smaller, and more coriaceous



FIGURE 1. A & B, *Spiraeanthemum graeffei*, from Smith 5800; A, distal portions of branchlets, with foliage, mature stipules, and ♀ inflorescences, $\times 1/2$; B, ♀ flower with 1 calyx lobe removed, showing disk lobes, sterile stamens, and carpels, $\times 20$. C & D, *Spiraeanthemum serratum*, from DA 7126; C, distal portion of branchlet, with foliage and maturing ♀ inflorescences, $\times 1/2$; D, maturing ♀ flower with 2 calyx lobes removed, showing disk lobes, sterile stamens, and maturing carpels, $\times 20$.

leaves than *S. katakata*, but the now available material shows these characters to be inconsequential.



DISTRIBUTION: Endemic to Fiji, and now known from Viti Levu, Ovalau, Vanua Levu, and possibly Kandavu (the last depending upon the accuracy of Seemann's published statement only). Of this most abundant Fijian species of the genus about 50 collections are at hand.

LOCAL NAMES: In addition to the usual name *katakata*, names noted locally on Viti Levu have been *kutakuta*, *kau tambua*, *nambosawa*, *rure*, *singasinga*, *tandalo*, and *vurewai*, on Vanua Levu *wakathere*. Some of these names are doubtless questionable.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mt. Evans Range, *Greenwood 863A*; summit of Mt. Koroyanitu, high point of Mt. Evans Range, *Smith 4192*; vicinity of Nandarivatu, *Gibbs 673*, *Gillespie 4021*; slopes of Mt. Nanggaranambuluta, *Webster & Hildreth 14230*; western and southern slopes of Mt. Tomaniwi, *Smith 5222*. NANDRONGA & NAVOSA: Nausori Highlands, *DF 828*; Numbutautau, upper Singatoka River, *DF 1186*; northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, *Smith 5429*. NAMOSI: Hills north of Wainavindrau Creek, between Korombasambasanga Range and Mt. Naitarandamu, *Smith 8410*; vicinity of Namosi, *Gillespie 2589*. RA: Vicinity of Nasukamai, *Gillespie 4691.7*; Numbumakita, on Wanggaitambua Creek, *Gibbs 880*. NATTASIRE: Nakatia, Lomaivuna Tikina, *DA 2738*. OVALAU: *Milne 267*; hills west of Lovoni Valley, on ridge south of Mt. Korolevu, *Smith 7512*. VANUA LEVU: MATHUATA: Mt. Ndelaikoro, *DA 12826*. MATHUATA-THAKAUNDOVE boundary: Crest of Korotini Range, between Navitho Pass and Mt. Ndelaikoro, *Smith 553*. THAKAUNDOVE: Hills south of Natewa, Natewa Peninsula, *Smith 1967*.

Spiraeanthemum katakata is more closely allied to *S. samoense* A. Gray than to the two preceding Fijian species, but the Samoan endemic is sharply characterized by its comparatively conspicuous, hispidulous indument, its elongate stipules, its serrulate leaf blades, its longer ultimate inflorescence branchlets, and its often glabrous disk lobes.

2. *ACSMITHIA* Hoogl. in *Blumea* 25: 492. 1979.

Spiraeanthemum sensu A. Gray et auct. p. p.; non A. Gray sensu lectotypi.

A genus closely related only to *Spiraeanthemum*; shrubs or trees with ♂ flowers; stipules ovate and caducous (in our species), leaving inconspicuous, transversely elliptic, nearly straight scars; leaves simple, verticillate in whorls of 3 or 4 (or rarely 5); inflorescence and basic floral characters as in *Spiraeanthemum* but inflorescence branches usually ternately or quaternately arranged and flowers always ♂; disk lobes often 8 (sometimes 10 or 12), free or rarely connate in pairs; stamens twice as many as calyx lobes or rarely irregular in number and sometimes only as many as calyx lobes; carpels with 1 (in our species), 2, or 4 ovules (these infrequently 3, 5, or 6); seeds with a distal wing, the nucellus basal.

TYPE SPECIES: *Acsmithia pulleana* (Schlechter) Hoogl. (*Spiraeanthemum pulleanum* Schlechter).

DISTRIBUTION: New Guinea and the Moluccas, northeastern Queensland, New Caledonia, and Fiji, with 14 species. The Fijian species is endemic and terminates the generic range to the east.

The genus and several of its species have been mentioned in pre-1979 literature, but none of the names were validly published prior to Hoogland's treatment.

1. *Acsmithia vitiensis* (A. Gray) Hoogl. in *Blumea* 25: 501. 1979. FIGURE 2B-D.

Spiraeanthemum vitiense A. Gray in Proc. Amer. Acad. Arts 3: 128. May, 1854, Bot. U. S. Expl. Exped. 1: 669. June, 1854, Atlas, pl. 83, B. 1856, in Ann. Sci. Nat. Bot. IV. 4: 177. 1855; C. Muell. in Walp. Ann. Bot. Syst. 5: 24. 1858; Seem. Viti, 437. 1862, Fl. Vit. 111. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 163, as

FIGURE 2. A, *Spiraeanthemum graeffei*; seed, $\times 30$. B-D, *Acsmithia vitiensis*: B, distal portion of branchlet, with foliage and inflorescences, $\times 1/2$; C, seed, $\times 30$; D, flower with 2 calyx lobes removed and some anthers fallen, showing disk lobes, stamens, and maturing carpels, $\times 20$. A from *Gillespie 2728*, B & D from *Smith 7699*, C from *DA 1743*.

Spireantheum v. 1890; Gibbs in J. Linn. Soc. Bot. 39: 144. 1909; A. C. Sm. in J. Arnold Arb. 33: 140. 1952; J. W. Parham, Pl. Fiji Isl. 82. 1964, ed. 2. 122. 1972.

An often gnarled shrub or small tree to 4 m. high, known from elevations of 450–1,200 m. in thickets on crests and ridges or in open places. The filaments and styles are white; as far as dated material is available, flowers have been obtained in June and September and fruits in September.

TYPEIFICATION: Gray's type material apparently came from two Vanua Levu plants, one from Mbua Bay (altitude not stated, but probably from hills considerably inland), Mbua Province, and the other from Mathuata Province at about 1,500 ft. (perhaps from the Mathuata Range). It is not now possible to separate the two parts, an appropriate citation being: *U. S. Expl. Exped.* (US 47621 HOLOTYPE; putative ISOTYPES at B, GH, K, NY, P), collected in 1840 on Vanua Levu in the vicinity of Mbua Bay, Mbua Province, and in Mathuata Province.

DISTRIBUTION: Endemic to Fiji and now known definitely from Viti Levu, Ovalau, and Vanua Levu.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Tholo-i-Nandarivatu, *Gibbs* 732. NAMOSI: Summit and upper slopes of Mt. Voma, *DA* 1743, 1910, 13966. VITI LEVU without further locality, *Graeffe* 16, p. p. OVALAU: Summit of Mt. Tana Lailai and adjacent ridge, *Smith* 7699. FIJI without further locality, *Horne* 759, 1104, 1113.

Six species of *Acsmithia* have carpels with solitary ovules, five of these being New Caledonian endemics and the sixth *A. vitiensis*. The Fijian species is believed most closely related to the New Caledonian *A. brongniartiana* (Schlechter) Hoogl. The remaining eight species (New Caledonia, Australia, New Guinea, and Moluccas) have 2–4 (–6) ovules per carpel.

3. GEISSOIS Labill. Sert. Austro-Caled. 50. 1825; A. Gray, Bot. U. S. Expl. Exped. 1: 678. 1854; Seem. Fl. Vit. 108. 1866; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 18a: 237. 1930; A. C. Sm. in J. Arnold Arb. 33: 120. 1952, in op. cit. 36: 278. 1955; Hutchinson, Gen. Fl. Pl. 2: 11. 1967.

Trees or shrubs with ♂ flowers; stipules often large, free or proximally connate, caducous or sometimes subsistent, the scars elongate, straight or slightly curved, sometimes forming a continuous ring; leaves opposite, digitately 3- or 5-foliolate (in all our species 3-foliolate); inflorescences axillary or borne on defoliate branchlets, racemose, solitary or few arising from an inconspicuous glomerule, the flowers comparatively large, the pedicels articulate near or below middle, the calyx and filaments red; calyx lobes 4 or 5, valvate; petals absent; disk pulvinate, entire or inconspicuously grooved; stamens numerous (in our species 8–26), the filaments comparatively long, the anthers small, didymous; ovary 2-locular, the ovules apotropous, biseriate, numerous (20–42 per locule in our species); calyx and stamens caducous in fruit; fruit a coriaceous, cylindric, septically 2-valved capsule, sometimes falcate, the valve margins incurved over the seeds, the seeds numerous, irregularly winged at both ends and often narrowly so laterally.

TYPE SPECIES: *Geissois racemosa* Labill.

DISTRIBUTION: Australia, New Caledonia, Santa Cruz Islands, New Hebrides, and Fiji, with 17–20 species. Four endemic Fijian species terminate the generic range to the east.

KEY TO SPECIES

- Inflorescences robust, 20–45 cm. long, the stamens 14–26; leaves comparatively large, the petiole 1.5–8 cm. long, the petiolules 1.5–8 cm. long, the leaflet blades usually 24–50 × 10–19 cm., with 13–20 secondary nerves per side; stipules large, ovate-oblong, densely velutinous-hispidulous on both surfaces, up to 6 × 4.5 cm., comparatively persistent, usually laterally connate at base and often cupuliform, recurved at margin. 1. *G. superba*

Inflorescences much smaller, not exceeding 10.5 cm. in length, the stamens 8–15; leaves smaller, the petiole rarely exceeding 5 cm. in length, the petiolules to 6 (usually less than 2.5) cm. long, the leaflet blades rarely more than 23 × 10.5 cm., usually much smaller, with not more than 15 secondary nerves per side; stipules usually not persistent at penultimate node, or if so then oblong or elliptic or lanceolate and not more than 2 cm. broad.

Leaflets nearly sessile, the blades rounded to subacute at base, the petiolules of lateral blades up to 2 (rarely 3) mm. and of terminal one up to 3 (rarely 6) mm. long; leaflet blades hispidulous on both surfaces, the hairs usually persistent, densest on costa and secondaries; stipules rarely subsistent, lanceolate, to 6.5 × 1.5 cm., free to base, densely velutinous-hispidulous on both surfaces, not recurved at margin; branchlets, petioles, and petiolules copiously setulose or strigillose, rarely subglabrate; inflorescence rachis and pedicels hispidulous, the calyx lobes sparsely strigillose on both surfaces. 2. *G. imthurnii*

Leaflets obviously petiolulate, the petiolules usually 4 mm. or more long (if shorter than the leaflet blade base attenuate or long-decurrent); leaflet blades glabrous or merely faintly strigillose on costa.

Stipules at first coherent into a subglobose bud, subsistent, at length ligulate-oblong, shortly connate basally but not cupuliform, up to 10 × 2 cm., copiously hispid without with hairs 1.5–2.5 mm. long, glabrous within; branchlets robust, distally conspicuously flattened, the petioles similarly flattened, copiously hispidulous or strigillose or glabrate, the petiolules 1–6 cm. long, the leaflet blades (8–) 11–23 × (3.5–) 6.5–10.5 cm.; calyx lobes 6–7 mm. long. 3. *G. stipularis*

Stipules at first coherent into a laterally flattened, ovoid bud, usually early caducous, rarely subsistent beyond ultimate node and then apparently not exceeding a size of about 3 × 1 cm., variously pilose or glabrous on both surfaces; branchlets subterete or distally slightly flattened, the petioles semiterete, sparsely strigillose and glabrate, the petiolules up to 2.5 cm. long, the leaflet blades usually 2–17 (–19) × 1.5–9 (–10) cm.; calyx lobes 4.5–6 mm. long. 4. *G. ternata*

1. *Geissois superba* Gillespie in Bishop Mus. Bull. 83: 9, fig. 9. 1931; A. C. Sm. in J. Arnold Arb. 33: 121. 1952; J. W. Parham, Pl. Fiji Isl. 78, fig. 31. 1964, ed. 2. 120, fig. 33. 1972. FIGURE 3A.

A tree 6–13 m. high, occurring in dense forest or on its edges at elevations of 150–900 m.; the inflorescences are borne on defoliate branchlets or sometimes associated with leaves; the calyx and filaments are crimson to dull red or pinkish red; and the anthers are yellow. Flowers have been obtained between October and May, fruits between July and December.

TIPIFICATION: The type is *Gillespie 4274* (BISH HOLOTYPE; ISOTYPES at BISH, GH, K, US), collected Dec. 10, 1927, along the trail between Nandarivatu and Vatuthere, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from forested areas of Viti Levu.

LOCAL NAME: *Vure*, a name well established for *Geissois* in the generic sense.

AVAILABLE COLLECTIONS: VITI LEVU: Mba: Vicinity of Nandarivatu, *Gillespie 3178*. NADRONGA & NAVOSA: Northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, *Smith 5434*. SERUA: Inland from Korovisilou, *DA 1434*. NAMOSI: Valley of Wainambua Creek, south of Mt. Naitarandamu, *Smith 8772*. *DA 14219*; Mt. Voma, *DA 11639*. NAITASIRE: Central Road, *Tothill 471*. VITI LEVU without further locality, *Tothill 189c*.

The striking *Geissois superba* is the most robust species of the genus in Fiji, at once recognized by its characteristic stipules and its large leaves and inflorescences.

2. *Geissois imthurnii* Turrill in J. Linn. Soc. Bot. 43: 19. 1915, in Hook. Icon. Pl. 31: pl. 3053. 1916; A. C. Sm. in J. Arnold Arb. 33: 122. 1952; J. W. Parham, Pl. Fiji Isl. 78. 1964, ed. 2. 120. 1972. FIGURES 3B, 4E.

A tree 5–20 m. high, with a trunk sometimes to 1 m. in diameter, found in usually dense forest at an altitude of 500–900 m.; the inflorescences are noted as occurring on defoliate branchlets; the calyx and filaments are bright red to deep rose-pink. Flowers have been observed between March and August, fruits only in February and March.

TIPIFICATION: The type is *im Thurn 137* (K HOLOTYPE; ISOTYPE at BM; photos of holotype at BISH, US), collected in flower on March 7, 1906, in the vicinity of Nandarivatu, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from a limited area of northern Viti Levu.

LOCAL NAMES: *Vure, vunga*; the latter, usually used for *Metrosideros* (Myrtaceae), was recorded by im Thurn, who noted that small crimson parrakeets feed on the plant.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Nukunuku Creek, west of Nandarivatu, *Vaughan 3401*; Koro-O road, west of Nandarivatu, *DA 13524*; Nandarivatu and immediate vicinity, *Greenwood 886, Parks 20671, Degener 14265, Reay 17, Vaughan 3432, DA 315, Watkins 767*; vicinity of Navai, *DA 15096*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 12650 (Melville et al. 7023)*. FIJI without further locality, *DA L.13454 (DF 1237)*.

Geissois imthurnii, although sympatric with *G. superba* in the vicinity of Nandarivatu, is readily distinguished by its indument, its subsessile leaflets, its smaller inflorescences, and its very different stipules. The sole specimen from the Nausori Highlands is sterile but seems correctly placed here, although its leaves are unusually large, with petioles to 13.5 cm. long and leaflet blades to 26.5 × 13.5 cm.

3. *Geissois stipularis* A. C. Sm. in J. Arnold Arb. 33: 123. 1952; J. W. Parham, Pl. Fiji Isl. 78. 1964, ed. 2. 120. 1972. FIGURES 3C, 4A.

A tree 5–15 m. high, occurring in dense, open, or dry forest at recorded elevations of 50–250 m.; the inflorescences are borne on defoliate branchlets; the calyx lobes and filaments are bright red, the anthers, disk lobes, and ovaries are yellow, and the styles are red like the filaments. Flowers have been collected between September and December, fruits only in September and October.

TYPIFICATION: The type, a sterile collection, is *Gillespie 2118* (BISH HOLOTYPE; ISOTYPES at GH, US), obtained Aug. 9, 1927, in the vicinity of Tamavua, Naitasiri Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known with certainty only from Viti Levu.

LOCAL NAME: *Vure*.

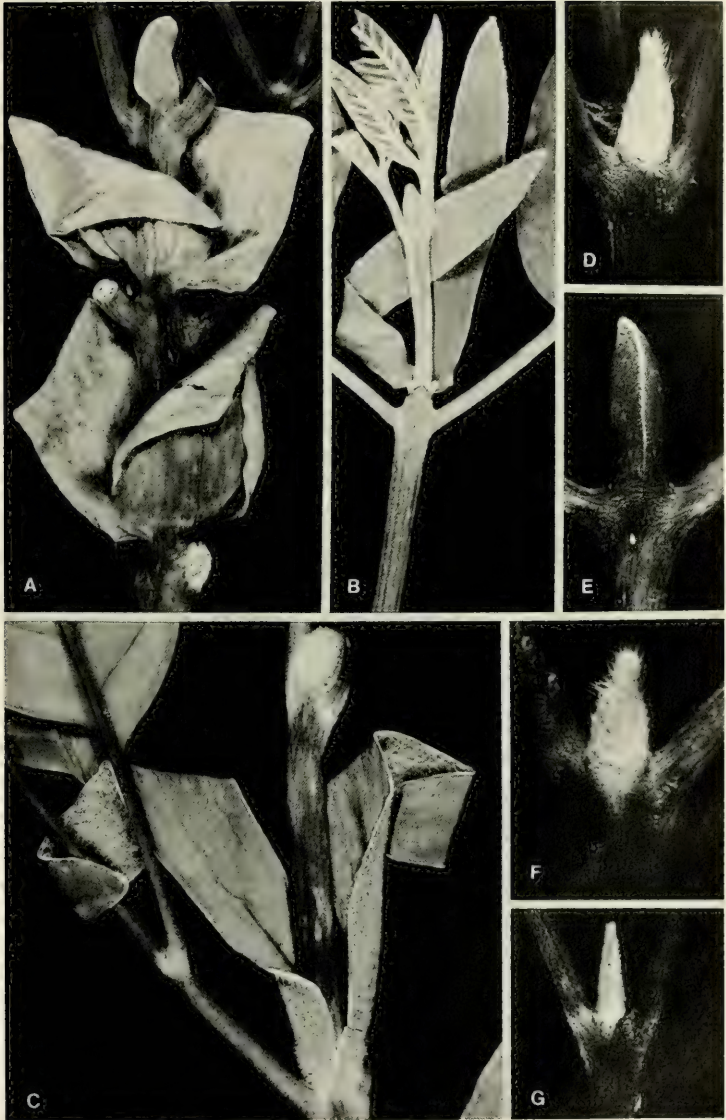
AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mountains (presumably foothills but no recorded elevation) near Lautoka, *Greenwood 343*. SERUA: Hills west of Waivunu Creek, between Ngaloa and Korovou, *Smith 9246, 9328*. NAMOSI: Hills bordering Wainavindrau Creek, vicinity of Wainimakutu, *Smith 8573, 8557*; Mau turnoff (from Queen's Road), *DA 11589*. NAITASIRE: Vicinity of Navuso, *DA 26*. VITI LEVU without further locality, *Parks 20934a, 20940*. FIJI without further locality, *DA 3933*.

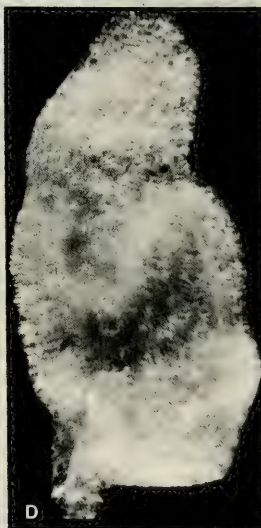
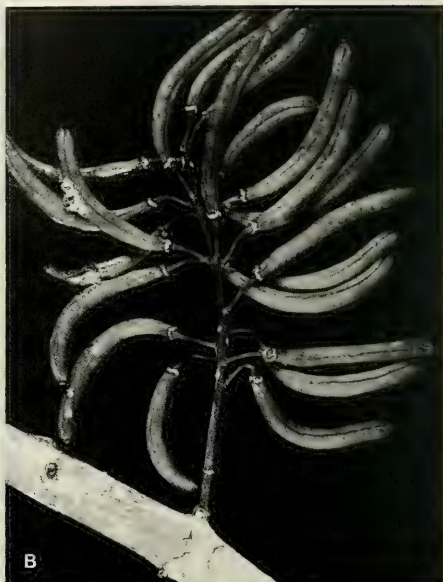
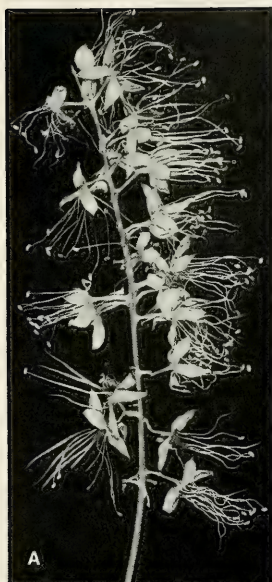
Geissois stipularis, now much better known than when it was first described, is readily distinguished from *G. superba* and *G. imthurnii* by stipular and foliage characters. It may seem to resemble some large-leaved specimens of *G. ternata* var. *ternata*, but its foliar indument and mature stipules readily distinguish it; in the absence of developed stipules the shape of the stipule bud seems a dependable character.

4. *Geissois ternata* A. Gray, Bot. U. S. Expl. Exped. 1: 679. 1854; A. C. Sm. in J. Arnold Arb. 33: 124. 1952.

DISTRIBUTION: Endemic to Fiji. While the three species of *Geissois* discussed above appear limited to Viti Levu, *G. ternata* has a broader distribution within Fiji and is

FIGURE 3. A, *Geissois superba*; stipules at ultimate, penultimate, and antepenultimate nodes of branchlet, × 1, from *Smith 5434*. B, *Geissois imthurnii*; stipules at ultimate and penultimate nodes of branchlet, × 1, from *Degener 14265*. C, *Geissois stipularis*; stipules at ultimate and penultimate nodes of branchlet, × 1, from *Gillespie 2118*. D, *Geissois ternata* var. *ternata*; stipules at ultimate node of branchlet, × 4, from *Smith 5969*. E, *Geissois ternata* var. *glabrior*; stipules at ultimate node of branchlet, × 4, from *Smith 343*. F, *Geissois ternata* var. *serrata*; stipules at ultimate node of branchlet, × 4, from *St. John 18128*. G, *Geissois ternata* var. *minor*; stipules at ultimate node of branchlet, × 4, from *DA 14055*.





more variable. The four varieties discussed by me in 1952 seem reasonably constant and readily accommodate the more recently available collections.

LOCAL NAMES: *Vure*, *vurevure*, and *vota* are applicable to all the varieties, and *vunga* has also (perhaps erroneously) been recorded.

KEY TO VARIETIES

- Leaves comparatively large, the petiolules (2-) 4-25 mm. long, the leaflet blades usually 5-17 × 3-9 cm., obtuse to acute at base, obtusely cuspidate to acuminate at apex; inflorescences 4-10.5 cm. long, the stamens 12-15, the disk 0.8-1.2 mm. high, the ovules 36-42 per locule.
 Leaflet blades entire, usually 5-15 × 3-7.5 cm., the secondary nerves 5-11 per side.
 Stipules copiously setulose with spreading hairs 0.2-1 mm. long. 4a. var. *ternata*
 Stipules glabrous on both sides or strigillose with appressed hairs 0.1-0.4 mm. long, sometimes puberulent-tomentellous at margin. 4b. var. *glabrior*
 Leaflet blades obviously denticulate-serrulate at margin, large, usually 9-19 × 4-10 cm., the secondary nerves 9-13 per side; stipules copiously setulose with hairs 1.5-2 mm. long. 4c. var. *serrata*
 Leaves comparatively small, the petiolules 1-11 mm. long, the leaflet blades usually 3-9.5 × 1.5-5 cm., attenuate to acute at base, obtuse to rounded at apex, entire; stipules copiously setulose; inflorescences 2.5-8 cm. long, the stamens 8-12, the disk 0.5-0.6 mm. high, the ovules 20-34 per locule.
 4d. var. *minor*

4a. *Geissois ternata* var. *ternata*; A. C. Sm. in J. Arnold Arb. 33: 126. 1952; J. W. Parham, Pl. Fiji Isl. 78. 1964, ed. 2. 120. 1972. FIGURES 3D, 4B, 88 (upper).

Geissois ternata A. Gray, Bot. U. S. Expl. Exped. 1: 679. 1854, Atlas, pl. 86. 1856; Seem. in Bonplandia 9: 256. 1861, Viti, 437. 1862, Fl. Vit. 109. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 163. 1890; Pampan. in Ann. Bot. (Rome) 2: 58. 1905; Gibbs in J. Linn. Soc. Bot. 39: 144. 1909.

A sometimes spreading tree 5-20 m. high, found from near sea level to an elevation of 900 m. in dense or open forest or on its edges or on open hillsides. The inflorescences are usually borne on defoliate branchlets but are sometimes associated with foliage; the pedicels, calyx lobes, filaments, and styles are bright red; the anthers, ovaries, and disk are yellow; and the fruit is green to dull yellow and often red-tinged. Flowers and fruits have been noted in most months.

TYPEIFICATION: The type is *U. S. Expl. Exped.* (US 47817 & 47818 HOLOTYPE; putative ISOTYPES at GH, K, NY), collected in 1840 in part on Ovalau and in part in Mathuata Province, Vanua Levu. It is not now possible to attach individual specimens to localities and therefore the two US sheets may be taken together as the holotype; 47817 bears fruits and 47818 flowers. Possibly the whole of the material is from more than two plants.

DISTRIBUTION: Known definitely from five of the high islands, but to be anticipated on others; about 30 collections are at hand.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Northern portion of Mt. Evans Range, between Mt. Vatuyani and Mt. Natondra, *Smith* 4271; Vunayasi, south of Nandi, *DA* 2370; vicinity of Nandariavatu, *Gibbs* 591, *Smith* 5969. NANDRONGA & NAVOSA: Nausori Highlands, *DA* 15604; Yawe, vicinity of Mbalo, near Vatukarasa, *Degener* 15274. SERUA: Mbuyombuyo, near Namboutini, *Tabualewa* 15609; Thulanuku, vicinity of Ngaloa, *Degener* 15120. TAILEVU: Matavatathou, *DA* 9235. KANDAVU: *Seemann* 201; hills above Namalata and Ngaloa Bays, *Smith* 76. OVALAU: Hills west of Lovoni Valley, on ridge south of Mt. Korolevu, *Smith* 7521. NGAU: *Milne* 231. FIJI without further locality, *Horne* 580.

4b. *Geissois ternata* var. *glabrior* A. C. Sm. in J. Arnold Arb. 33: 127. 1952; J. W. Parham, Pl. Fiji Isl. 78. 1964, ed. 2. 120. 1972. FIGURE 3E.

A sometimes spreading tree 4-25 m. high (rarely noted as a large shrub), occurring in open forest or on its edges or on open slopes, from near sea level to an altitude of 600

FIGURE 4. A, *Geissois stipularis*; inflorescence, × 1. B, *Geissois ternata* var. *ternata*; infructescence, × 1. C & D, *Geissois ternata* var. *minor*; C, distal portions of branchlets, with foliage and inflorescences, × 1/2; D, seed, × 30. E, *Geissois imthurnii*; seed, × 15. A from *Smith* 9328, B from *Smith* 7521, C from *DA* 14055, D from *Gillespie* 3898, E from *Degener* 14265.

m. Flower and fruit colors are the same as in var. *ternata*, and similarly the flowers and fruits may be seen throughout the year.

TIPIFICATION: The type is *Smith 1590* (NY HOLOTYPE; many ISOTYPES), collected April 24, 1934, in the upper Ndama River Valley, Mbua Province, Vanua Levu.

DISTRIBUTION: *Geissois ternata* var. *glabrior* is less frequent on Viti Levu than var. *ternata*, but it is the only variety of the species with a distribution extending into the Lau Group. It is thus far known from eight islands and 25 collections.

REPRESENTATIVE COLLECTIONS: VITILEVU: MBA: Vunanamo, *DA 14796*. NAMOSI: Between Namuamua and Nanggarawai, Wainikoroiuva River, *Gillespie 3213*. NAITASIRE: Navutu, near Viria, *DA 631*. KORO: Western slope, *Smith 1085*. NGAU: Hills east of Herald Bay, inland from Sawaieke, *Smith 7987*. VANUA LEVU: MATHUATA: Seangangga Plateau, *DA 13929*. THAKAUNDROVE: Natua, Wailevu Tikina, *DA 15697*; hills south of Nakula Valley, vicinity of Savusavu, *Smith 343*; between Nathula and Valovoni, Sanggani Tikina, *Howard 141*. TAVEUNI: Western slope, between Somosomo and Wairiki, *Smith 847*; vicinity of Waiyevo, *Gillespie 4699*. MOALA: *Tohill 189*. VANUA MBALAVU: Vicinity of Lomaloma, *Garnock-Jones 1090*; slopes of highest peak, *Bryan 583*. LAKEMBA: *Harvey*; hills above Naivanavana Valley, *Garnock-Jones 931*.

4c. *Geissois ternata* var. *serrata* A. C. Sm. in J. Arnold Arb. 33: 127. 1952; J. W. Parham, Pl. Fiji Isl. 78. 1964, ed. 2. 122. 1972. FIGURE 3F.

A tree about 15 m. high, with a trunk 8–10 cm. in diameter, found in woods at an elevation of 120–240 m. The flowers are red and were obtained, together with fruits, in July.

TIPIFICATION: The type and only known collection is *St. John 18128* (BISH HOLOTYPE; ISOTYPES at BISH, K, US), collected July 19, 1937, north of Yalombi, along Olo Creek, Waya Island, Yasawas.

DISTRIBUTION: Known only from the type collection; no other material of *Geissois* has been seen from the Yasawas, although the plant is said to be locally common on Waya.

USE: The collector indicates that the wood is used in house-building, and also that birds visit the flowers.

4d. *Geissois ternata* var. *minor* A. C. Sm. in J. Arnold Arb. 33: 128. 1952; J. W. Parham, Pl. Fiji Isl. 78. 1964, ed. 2. 120. 1972. FIGURES 3G, 4C & D.

A gnarled shrub or tree 2–5 m. high, occurring in dense forest, in thickets on exposed ridges, and on open slopes, at elevations of 500–1,050 m. The inflorescences are found on defoliate branchlets or together with the foliage, and the flower colors are as usual for the species. Flowers have been obtained between October and April, fruits only in November and December.

TIPIFICATION: The type is *Smith 679* (NY HOLOTYPE; many ISOTYPES), collected Nov. 29, 1933, on the summit of Mt. Mbatini, Thakaundrove Province, Vanua Levu.

DISTRIBUTION: Known only from the two large islands and usually from comparatively high elevations.

AVAILABLE COLLECTIONS: VITILEVU: MBA: Mt. Evans Range, *Greenwood 119, DA 14180*; Natua Levu, Mt. Evans Range, *DA 14055*; vicinity of Nandarivatu, *Gillespie 3898, DA, Dec. 25, 1949, 2110, 2111, 9729, 11118*. NAMOSI: Summit of Mt. Voma, *Gillespie 2730*, p. p. VANUA LEVU: MATHUATA: Summit ridge of Mt. Numbuiloa, east of Lambasa, *Smith 6514*.

4. WEINMANNIA L. Syst. Nat. ed. 10. 1005, 1367. 1759; Seem. Fl. Vit. 109. 1866; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 18a: 250. 1930; A. C. Sm. in J. Arnold Arb. 33: 128. 1952; Hutchinson, Gen. Fl. Pl. 2: 9. 1967. Nom. cons.

Trees or shrubs with ♀ flowers or dioecious or polygamodioecious (as often in our species); stipules sometimes connate, caducous; leaves opposite, simple or 3-foliate

(rarely 2-foliolate) or imparipinnately compound, the rachis often winged; inflorescences axillary or terminal, racemose, the racemes solitary or aggregated (often 2-4) on a short common peduncle, the flowers small, if ♂ sometimes protandrous, often fasciculate along inflorescence rachis, the petals and filaments white or greenish; flowers 4-merous (as in our species) or 5-merous; calyx lobes 4 or 5, imbricate, often persistent; petals 4 or 5, imbricate, often persistent; disk divided into 8 or 10 free lobes; stamens 8 or 10, inserted between disk lobes, the filaments usually filiform, the anthers small, didymous; ovary 2-locular (present but with lacking or undeveloped ovules in ♂ flowers), the ovules anatropous, biseriolate, few to many (3-6 per locule in Fijian species), pendulous from upper part of locules, the styles short, subsistent; fruit a septicidally 2-valved capsule, usually small and ellipsoid, the seeds pilose, often comate at both ends (as in our species), not or rarely inconspicuously winged.

TYPE SPECIES: *Weinmannia pinnata* L., the only original species.

DISTRIBUTION: Madagascar and the Mascarenes to Malesia and eastward to New Zealand, the Austral Islands, and the Marquesas, and more abundantly in America from Mexico and the West Indies southward, with a center of diversity in the Andes, and with 170-190 species. Five endemic species are known in Fiji.

KEY TO SPECIES

- Leaves simple (or very rarely 2-foliolate), the blades oblong-elliptic, glabrous, usually 7-11 × 2.5-6 cm. (rarely as small as 2 × 1.2 cm.), the secondary nerves usually 7-14 per side, the marginal crenations usually 1 or 2 per centimeter; stipules comparatively large, elliptic or suborbicular-obovate, 13-25 × 8-15 mm. (rarely as small as 4 × 2 mm.), conspicuously barbellate in axils with often subsistent tufts of stiff hairs 1-1.5 mm. long; perianth comparatively large, caducous in fruit, the calyx lobes 1.2-1.5 mm. long, the petals 1.6-1.8 mm. long. 1. *W. affinis*
- Leaves compound, 3-9(-13)-foliolate, very rarely simple or 2-foliolate, the leaflet blades not exceeding 9.5 × 4.5 cm., with fewer than 12 secondary nerves per side, the marginal crenations 2-4 per centimeter; stipules smaller, variously shaped but not exceeding 12 × 16 mm., inconspicuously strigose-barbellate in axils; perianth comparatively small (not known for species no. 2), the calyx lobes less than 1.2 mm. long, the petals less than 1.6 mm. long.
- Leaflets comparatively large, only rarely less than 2 × 1 cm. and usually much larger, the marginal crenations only rarely as few as 8 per side; racemes more than 4 cm. long, often up to 12 cm. or longer.
- Leaves 5-foliolate (as far as known), with the petiole, rachis, and lower leaflet surfaces hispidulous (hairs 0.5-1 mm. long); stipules suborbicular or ovate-oblong, about 10 × 7-10 mm., conspicuously dentate. 2. *W. spiraeoides*
- Leaves glabrous or with the petiole, rachis, and costa of lower leaflet surfaces puberulent (hairs up to 0.2 mm. long); stipules entire.
- Stipules suborbicular, variable in size (1.5-12 × 1.5-16 mm.) but usually slightly broader than long; leaves 3-9-foliolate (very rarely simple or 2-foliolate), the leaflets predominantly elliptic or oblong-elliptic, (1.5-) 3-7 × (1-) 1.2-3.8 cm. (terminal one rarely to 9.5 × 4.5 cm.); calyx lobes 0.5-0.7 mm. long; petals 1-1.3 mm. long; perianth persistent in fruit. 3. *W. richii*
- Stipules oblong or ovate to lanceolate, 3-10 × 1.5-5 mm., longer than broad; leaves 3-foliolate (as far as known), the leaflets predominantly lanceolate or lanceolate-elliptic, (2.5-) 3-5.5 × 1-2 cm. (terminal one sometimes to 7.5 × 2.8 cm.); calyx lobes 0.7-1.2 mm. long; petals 1.1-1.6 mm. long; perianth caducous in fruit. 4. *W. vitensis*
- Leaflets small, (5-) 8-20 × 3-9 mm., with 3-6 marginal crenations per side; leaves 3-13-foliolate (very rarely simple); racemes 2-3 cm. long, the flowers small, the calyx lobes 0.7-0.8 mm. long, the petals 1.2-1.3 mm. long; stipules suborbicular, 2-6 mm. in diameter, strongly revolute; perianth soon caducous. 5. *W. exigua*

1. *Weinmannia affinis* A. Gray, Bot. U. S. Expl. Exped. 1: 674. 1854; C. Muell. in Walp. Ann. Bot. Syst. 5: 30. 1858; Seem. in Bonplandia 9: 256. 1861, Viti, 437. 1862, Fl. Vit. 110. 1866; Engl. in Linnaea 36: 648. 1870; Drake, Ill. Fl. Ins. Mar. Pac. 163. 1890; Pampan. in Ann. Bot. (Rome) 2: 92. 1905; Gibbs in J. Linn. Soc. Bot. 39: 145. 1909; A. C. Sm. in J. Arnold Arb. 33: 130. 1952; J. W. Parham, Pl. Fiji Isl. 82. 1964, ed. 2. 122. 1972.

FIGURE 5A, B, E.

An often compact shrub or small tree 1-8 m. high, known from altitudes of 350-1,323 m. in dry forest, in the forest and dense thickets of crests and ridges, and on

open ridges. The petals, stamens, and ovaries are white, the styles purple-tinged, and the fruits red or pink-tinged. Flowers have been collected between December and June, fruits between May and January.

TYPEFICTION: The type is *U. S. Expl. Exped.* (US 48070 HOLOTYPE; ISOTYPES at GH, K, NY), a fruiting collection obtained in 1840 on Ovalau.

DISTRIBUTION: Endemic to Fiji and thus far known from Viti Levu, Ovalau, and Taveuni; 32 collections have been studied.

LOCAL NAMES: *Weinmannia* as a separate genus does not appear to have its own name in Fiji; such names as *vure* and *katakata*, sometimes applied to this and other species of the genus, are more commonly used for *Geissois* and *Spiraeanthemum* respectively.

REPRESENTATIVE COLLECTIONS: VITILEVU: MBA: Mountains near Lautoka, *Greenwood 247*; Mt. Evans Range, *DA 14184*; vicinity of Nandarivatu, *Gibbs 881*, *Greenwood 864*, *Smith 4905*; summit of Mt. Tomanivi, *Webster & Hildreth 14204*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 13890*; southern slopes of Nausori Highlands above Tumbenasolo, *Greenwood 1188*. NAMOSI: Korombasambasanga Range, *DA 2201*; slopes and summit of Mt. Voma, *Gillespie 2730*, p. p., *DA 13965*. VITI LEVU without further locality, *Seemann 197*. OVALAU: *Graeffe s. n.*; summit of Mt. Ndelaiovalau and adjacent ridge, *Smith 7608*. TAVEUNI: *Seemann 200*; borders of lake east of Somosomo, *Smith 878*.

Although *Weinmannia affinis* is sharply distinct from other Fijian species of the genus on the basis of its simple leaves with comparatively large blades and its large stipules, a gradation to forms with small leaves and stipules (as in *DA 2201* and *Smith 878*), apparently from especially exposed situations, may be noted. The species is more closely allied to the endemic Samoan *W. manuana* Christophersen than to other Fijian species.

2. *Weinmannia spiraeoides* A. Gray, Bot. U. S. Expl. Exped. 1: 677. 1854; C. Muell. in Walp. Ann. Bot. Syst. 5: 30. 1858; Seem. Viti, 437. 1862, Fl. Vit. 110. 1866; Engl. in Linnaea 36: 644. 1870; Drake, Ill. Fl. Ins. Mar. Pac. 164. 1890; A. C. Sm. in J. Arnold Arb. 33: 132. 1952; J. W. Parham, Pl. Fiji Isl. 82. 1964, ed. 2. 125. 1972.

A small tree, known from a single specimen from an elevation of about 150 m., apparently sharply characterized by the stiff indument and sharply serrate margins of its leaflets, as well as by its conspicuously dentate stipules.

TYPEFICTION: The holotype is *U. S. Expl. Exped.* (US 48073), collected in 1840 on Ovalau.

DISTRIBUTION: Endemic to Fiji and thus far known only from the sterile holotype.

Some doubt must remain attached to the status of *Weinmannia spiraeoides*, which conceivably is merely an aberrant juvenile form of *W. richii* (not known from Ovalau). Nevertheless, the foliage and stipular characters mentioned above have not been noted in other juvenile Fijian specimens, and so it seems advisable to retain *W. spiraeoides* as a distinct taxon.

3. *Weinmannia richii* A. Gray, Bot. U. S. Expl. Exped. 1: 675. 1854, Atlas, pl. 85, B. 1856; C. Muell. in Walp. Ann. Bot. Syst. 5: 30. 1858; Seem. Viti, 437. 1862, Fl. Vit. 110. 1866; Engl. in Linnaea 36: 643. 1870; Drake, Ill. Fl. Ins. Mar. Pac. 164.

FIGURE 5. A & B. *Weinmannia affinis*; A, distal portion of branchlet, with foliage and infructescences, showing stipules, $\times 1/2$; B, distal portion of branchlet, small-leaved variant, with young inflorescences, $\times 1/2$. C, *Weinmannia exigua*; foliage and stipules, $\times 2$. D, *Weinmannia richii*; protandrous flower, with 2 calyx lobes, 1 petal, and 2 stamens removed, showing disk lobes, mature stamens, and young gynoecium, $\times 30$. E, *Weinmannia affinis*; seed, $\times 40$. A & E from *Smith 7608*, B from *DA 2201*, C from *Howard 89*, D from *DF 1174*.



1890; A. C. Sm. in J. Arnold Arb. 33: 133. 1952; J. W. Parham, Pl. Fiji Isl. 82. 1964, ed. 2. 124. 1972. FIGURE 5D.

Weinmannia rhodogyne Gibbs in J. Linn. Soc. Bot. 39: 145. 1909; Turrill in op. cit. 43: 20. 1915.

An often compact shrub or small tree 1.5–7 m. high, found at elevations of 100–1,100 m. in open or dry forest, thickets, and ridge forest, and on dry slopes. The inflorescence peduncle and rachis are sometimes pinkish to dark red, the petals, stamens, and ovaries are white, and the fruit becomes pink or deep red. Flowers have been observed between May and January, fruits more or less throughout the year.

TYPIFICATION: The type of *Weinmannia richii* is *U. S. Expl. Exped.* (us 48071 HOLOTYPE; ISOTYPES at GH, K, NY), collected in 1840 in the vicinity of Mbua Bay (at about 600 m., i. e. some distance inland), Mbua Province, Vanua Levu; that of *W. rhodogyne* is Gibbs 594 (BM HOLOTYPE; ISOTYPE at K), obtained in August, 1907, in the vicinity of Nandarivatu, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from Viti Levu, Vanua Levu, and Taveuni; about 45 collections have been examined.

LOCAL NAMES: The several names recorded by collectors are probably all erroneous for a species of *Weinmannia*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 384*; Mba closed area, *DA 12515*; vicinity of Nandarivatu, *Degener & Ordenez 13599*, in *Thurn 73*; slopes of Mt. Nanggaranambuluta, east of Nandarivatu, *Gillespie 4333*. NANDRONGA & NAVOSA: Southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, *Smith 4710*; vicinity of Nandrau, *DF 1174*. SERUA: Vicinity of Namboutini, *DA L.13539 (DF 911)*. NAMOSI: Korombasambasanga Range, *DA 2188*; Mt. Voma, *DA 2598*, p. p. VANUA LEVU: MBUA: Vicinity of Ndama, *DA 2277*; vicinity of Nandi Bay, *Milne 251*. MATHUATA: Mt. Ndalanathau, *DA 16061*; Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, *Smith 6813*. TAVEUNI: Exposed summit ridge east of Somosomo, *Gillespie 4837*.

Weinmannia richii and *W. affinis*, although not forming a conspicuous element of the vegetation, are the most abundant species of the genus in Fiji. They are commonly sympatric at middle elevations on Viti Levu, especially in the frequently collected area around Nandarivatu.

4. *Weinmannia vitiensis* Seem. Fl. Vit. 110. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 164.

1890; Pampan. in Ann. Bot. (Rome) 2: 93. 1905; A. C. Sm. in J. Arnold Arb. 33: 135. 1952; J. W. Parham, Pl. Fiji Isl. 82. 1964, ed. 2. 125. 1972.

Weinmannia affinis var. β A. Gray, Bot. U. S. Expl. Exped. 1: 674. 1854; C. Muell. in Walp. Ann. Bot. Syst. 5: 30. 1858; Engl. in Linnaea 36: 649. 1870.

Weinmannia Seem. in Bonplandia 9: 256. 1861.

Weinmannia affinis sensu Seem. Viti, 437, p. p. 1862; non A. Gray.

A tree 3–18 m. high or a compact shrub, occurring in dense forest or in open places at elevations of 300–900 m. Its slightly fragrant flowers have white petals and filaments, and the mature fruits are brown. Flowers have been obtained only in March and July, fruits between March and September.

TYPIFICATION: The type of *Weinmannia vitiensis* in *Seemann 199* (K HOLOTYPE; ISOTYPES at BM, GH), collected on Kandavu in August or September, 1860. Gray based his *W. affinis* var. β on *U. S. Expl. Exped.* (GH, NY), obtained in 1840 on Ovalau.

DISTRIBUTION: Endemic to Fiji and known from several islands, but nowhere seeming frequent except on Moala.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Nausori Highlands, *DA 18858*. TAVEUNI: Hills east of Somosomo, west of old crater occupied by small swamp and lake, *Smith 8401*. MOALA: *Bryan 317*; Ndelaioala, *Smith 1354*. FIJI without further locality, *Harvey s. n.*

Weinmannia vitiensis, known from scattered localities on five of the high islands, is not sharply distinct from the more abundant *W. richii*, but I believe that it may be retained at the specific level on the basis of its differently shaped stipules and leaflets

(which seem uniformly three) and its somewhat larger flowers.

5. *Weinmannia exigua* A. C. Sm. in J. Arnold Arb. 33: 137. 1952; J. W. Parham, Pl. Fiji Isl. 82. 1964, ed. 2. 122. 1972. FIGURE 5C.

A shrub or small tree to 3 m. high, found in forest or in crest thickets at elevations of 150 to about 600 m. Flowers and fruits have been obtained only in May.

TYPEFICTION: The type is *Horne 632* (K HOLOTYPE; photos of holotype at BISH, US), collected in May, 1878, "on top of the mountains" between Waiwai and Lomaloma, Mathuata or Thakaundrove Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and apparently to Vanua Levu, where it seems rare. The second known collection, cited below, is sterile but unmistakably represents the species with very small leaflets otherwise collected only by Horne.

AVAILABLE COLLECTION: VANUA LEVU: THAKAUNDROVE: Near tributary of Sovivi Creek, south of Karoko, Tunuloa Tikina, Natewa Peninsula, *Howard 89*.

5. *Pullea* Schlechter in Bot. Jahrb. 52: 164. 1914; Perry in J. Arnold Arb. 30: 163. 1949; A. C. Sm. in op. cit. 33: 148. 1952, in op. cit. 36: 278. 1955; Hutchinson, Gen. Fl. Pl. 2: 9. 1967; Hoogl. in *Blumea* 25: 490. 1979.

Trees with ♂ flowers; stipules soon caducous, leaving short, transversely elliptic, straight scars; leaves opposite, simple; inflorescences axillary or pseudoterminal, paniculate, many-flowered, paired or ternate (or quaternate) and superposed, the flowers small, sessile or subsessile, often fasciculate in clusters at apices of ultimate inflorescence branchlets, the calyx and filaments white to yellowish or greenish; calyx lobes 5 or 6 (very rarely 7), narrowly imbricate; petals absent; disk divided into 10 or 12 lobes, these often coherent in pairs; stamens 10 or 12, the filaments slender, the anthers small; ovary semi-inferior or (as in our species) 1/3-1/4 inferior and only basally sunk into the hypanthium, 2-locular (very rarely 3-locular), the ovules apotropous, biseriate, 4 or 6 per locule, pendulous, the styles curved or ascending; fruit drupeaceous, probably becoming a tardily dehiscent capsule (not much altered in shape and size from maturing gynoeceium), containing 2 collateral pyrenes, these flattened-ovoid, the endocarp cartilaginous or crustaceous, the placenta apical, with 4 or 6 pendulous developing seeds, these flattened, oblanceolate to obdeltoid, with a proximal wing and a distal nucellus, the seeds perhaps ultimately becoming obovoid.

LECTOTYPE SPECIES: *Pullea mollis* Schlechter (vide Hutchinson, Gen. Fl. Pl. 2: 9. 1967), one of Schlechter's two original species.

DISTRIBUTION: New Guinea (and probably Morotai in the Moluccas), northeastern Queensland, and Fiji, with four species. The Fijian taxon is here considered an endemic species terminating the range of the genus to the east.

1. *Pullea perryana* A. C. Sm. in J. Arnold Arb. 33: 148. 1952, in op. cit. 36: 278. 1955; J. W. Parham, Pl. Fiji Isl. 78. fig. 32. 1964, ed. 2. 122. fig. 34. 1972; A. C. Sm. in Contr. U. S. Nat. Herb. 37: 71. 1967. FIGURES 6B-D, 7A & B.

Pullea glabra sensu Hoogl. in *Blumea* 25: 491, p. p., solum quoad spec. vit. 1979; non Schlechter.

A tree 2-12 m. high, with a trunk up to 23 cm. in diameter, known to occur from near sea level to an elevation of 626 m. in forest or on its edges, in hillside forest, and in the dense thickets and forest of crests and ridges. The calyx, filaments, and styles are white to cream-white, and the disk lobes become rich pink. Flowers have been obtained in most months, occurring together with young fruits; fully mature fruits have not yet been noted.

TYPEFICTION: The type is *B. H. Tothill 472 (or F472)* (K HOLOTYPE; ISOTYPES at BISH, US 1992912), collected in November, 1928, along the "Central Road," Naitasiri Province, Viti Levu.



DISTRIBUTION: Endemic to Fiji and now observed as fairly frequent in eastern Viti Levu (including Naingani Island), with a single collection from Ovalau.

LOCAL NAME: The name *mbulewa* was noted for DA 12463.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Prince's Road, DA 7565, 11786; Tholo-i-suva and vicinity, DA 1646, 11895, 12463, 12548, 12558, 13803, 14523, Bola 14. TAILEVU: Wainiveimbalambala Creek, DA 5834; Naingani Island, DA 3330, 3345. REWA: Mt. Korombamba, DA 3845. OVALAU: Summit of Mt. Ndelaivalau and adjacent ridge, Smith 7613.

Hoogland (1979, cited above) is probably correct in recognizing only one species (*Pullea glabra* Schlechter) of the genus in New Guinea in addition to the comparatively rare and very distinct *P. mollis* Schlechter. The characters utilized by Perry (1949, cited above) to distinguish five New Guinean species (in addition to *P. mollis*) refer to minor foliage variations, indument, and the number of flowers in a cluster, and are probably not very reliable.

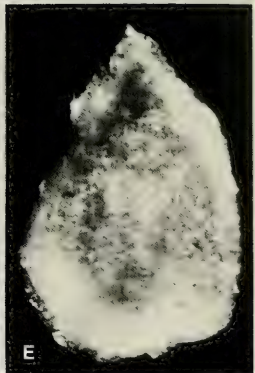
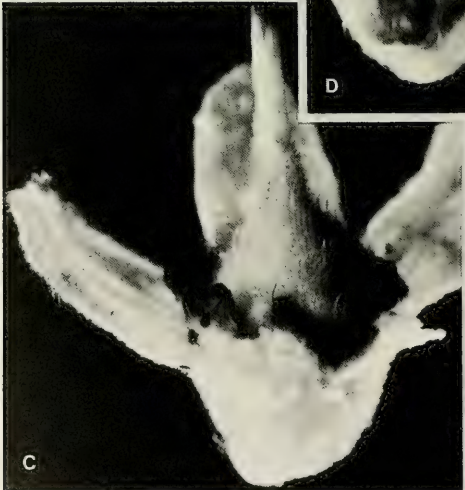
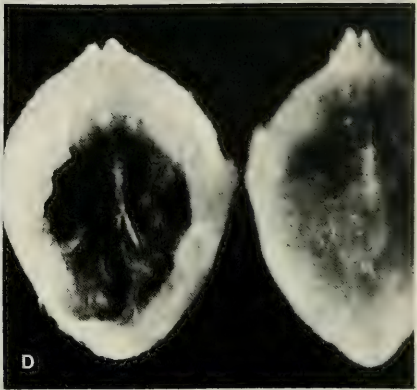
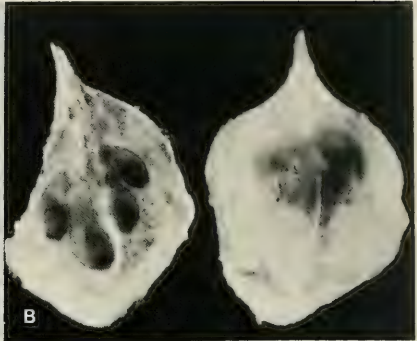
Nevertheless, I consider Hoogland's reduction of the Fijian taxon to the New Guinean *Pullea glabra* inadvisable, in view of the absence of the genus (as far as now known) from intervening areas. Differences between the two populations are discernible in stipules, extremes of leaf size and margin, flower arrangement, degree of submersion of the ovary into the hypanthium, and young seeds. These differences may be expressed in a key as follows:

Stipules (FIGURE 6B) obovate-suborbicular or obovate-elliptic, 8–12 × (3–) 5–11 mm., narrowed at base, rounded at apex, strongly revolute at margin; petioles (5–) 10–25 mm. long; leaf blades elliptic or lanceolate-elliptic, (4–) 7–18 (–23) × (2–) 3–9 (–12) cm., coarsely undulate-crenate at margin; flowers often solitary, paired, or in small clusters along ultimate inflorescence branchlets, less frequently densely aggregated at ends of ultimate branchlets; ovary (FIGURE 7A) 1/3–1/4 inferior, only the basal portion sunk into the broadly conical hypanthium; pyrenes of young fruits (FIGURE 7B) acuminate at apex, the endocarp crustaceous and brittle, the maturing ovules with a distinctly narrowed basal wing, oblancoolate. *P. perryana*

Stipules (FIGURE 6A) oblong-deltoid, 4–6 × 2–2.5 mm., broad-based, obtuse to subacute at apex, flat at margin; petioles 3–20 mm. long; leaf blades oblong- to obovate-elliptic to lanceolate-elliptic, (3–) 4–11 × (1–) 2.5–7.5 cm., obscurely to obviously crenate at margin; flowers often aggregated in clusters of 5–12 at ends of ultimate inflorescence branchlets, less frequently scattered along branchlets below terminal clusters; ovary (FIGURE 7C) half-inferior, the hypanthium cupuliform; pyrenes of young fruits (FIGURE 7D) acute at apex, the endocarp cartilaginous, not obviously crustaceous and brittle, the maturing ovules (FIGURE 7E) narrowed at base but with a less obvious wing, obdeltoid. *P. glabra*

The characters utilized above are neither entirely convincing nor thoroughly satisfactory, but at this stage it seems advisable to retain the Fijian material as representing a discrete taxon. If the genus should be discovered in the Solomons and New Hebrides this decision should be reviewed. At the moment it would appear that the Fijian population resulted from the establishment of a chance waif in a past geological period. In that case a different course of development would have been probable in contrast to the situation in New Guinea, where frequent contact among parts of the population of *Pullea glabra* has prevented the emergence of discrete taxa (except for var. *verticillata* Hoogl.). It may be noted that *P. perryana*, in respect to characters of stipules and leaf margins, is more suggestive of the Australian *P. stutzeri* (F. v. Muell.) Gibbs than of *P. glabra*.

FIGURE 6. A, *Pullea glabra*; stipules at ultimate node of branchlet, × 6. B–D, *Pullea perryana*; B, stipules at ultimate node of branchlet, showing ternately or quaternately superposed inflorescence buds, × 6; C, distal portions of branchlets, showing variability in foliage and inflorescences, × 1/3; D, flower, with some stamens removed, showing calyx lobes, disk lobes, stamens, and styles, × 20. A from Kairo & Streimann (NGF 35737), New Guinea, B from DA 11895, C from DA 12548 (detached branchlet with small leaves, upper left, from Smith 7613, detached large leaf, lower left, from DA 11895), D from Smith 7613.



FAMILY 118. DAVIDSONIACEAE

DAVIDSONIACEAE G. Bange in *Blumea* 7: 294. 1952.

A family formerly combined with the Cunoniaceae, differing in its alternate leaves, in the presence of rigid, stinging hairs on the branchlets, leaves, and inflorescences, in having its stamens scarcely exerted, and in its seeds lacking endosperm. Trees with ♂ flowers; stipules subreniform, dentate-serrate; leaves alternate, imparipinnately compound, large (to 1 m. long), the rachis roughly aculeate, the leaflets usually 11 or 13, decreasing in size proximally, penninerved, irregularly dentate-serrate at margin; inflorescences paniculate to glomerate-spicate; flowers ♀, actinomorphic; calyx gamosepalous, 4- or 5-lobed nearly half its length, the lobes valvate; petals absent; disk with 8 or 10 nectariferous scales; stamens 8 or 10, hypogynous, inserted on disk, the filaments short, sharply bent distally, the anthers 2-locular, versatile, longitudinally dehiscing; gynoecium 2-carpellate, the ovary superior, the ovules about 7 per locule, pendulous, anatropous, epitropous, the styles free, curved; fruit a drupe with 2 pyrenes, the seeds solitary in each pyrene, compressed, without endosperm, the embryo with plano-convex, straight cotyledons.

DISTRIBUTION: Australia (Queensland and northeastern New South Wales), with a single genus and species; cultivated in Fiji and perhaps elsewhere.

USEFUL TREATMENT OF FAMILY: BANGE, G. G. J. A new family of dicotyledons: Davidsoniaceae. *Blumea* 7: 293-296. 1952.

In erecting a new monotypic family for *Davidsonia*, Bange followed the suggestion of Engler (in Engl. & Prantl, *Nat. Pflanzenfam.* ed. 2. 18a: 261. 1930). The family has been accepted as distinct by Schulze-Menz (in Melchior, *Syll. Pflanzenfam.* ed. 12. 2: 207. 1964), Takhtajan (1969, 1980), Thorne (1976), Dahlgren (1980), Cronquist (1981), and most recent students of the cunoniaceous alliance. Epitropous ovules, mentioned as a distinguishing feature by Bange, occur in two genera of Cunoniaceae, as mentioned above in the treatment of that family.

1. DAVIDSONIA F. v. Muell. *Fragm. Phyt. Austral.* 6: 4. 1867; G. Bange in *Blumea* 7: 294. 1952; Hutchinson, *Gen. Fl. Pl.* 2: 12. 1967.

Characters and distribution of the family.

TYPE SPECIES: *Davidsonia pruriens* F. v. Muell.

1. *Davidsonia pruriens* F. v. Muell. var. **pruriens**; G. Bange in *Blumea* 7: 296. *fig. 1-19*. 1952; J. W. Parham, *Pl. Fiji Isl.* 82. 1964, ed. 2. 125. 1972.

Davidsonia pruriens F. v. Muell. *Fragm. Phyt. Austral.* 6: 4. *pl. 46*. 1867; Engl. in Engl. & Prantl, *Nat. Pflanzenfam.* ed. 2. 18a: 261. 1930; B. E. V. Parham in *Agr. J. Dept. Agr. Fiji* 10: 114. 1939; G. Bange in *Blumea* 7: 294, p. p. *major*. 1952.

A slender tree to 12 m. high, infrequently cultivated in Fiji, with large, compound leaves, an ample, paniculate, long-pedunculate inflorescence, reddish calyces, and globose-ovoid fruits about 5 cm. in diameter. It has been collected in flower in January (Lam, cited below); in Australia (fide Bange) flowers have been collected between May and February, fruits in August and September.

FIGURE 7. A & B, *Pullea perryana*: A, fully mature flower, with 3 calyx lobes removed, the stamens fallen, × 20; B, pyrenes of young fruit, the left one with the ventral wall removed to show 4 young seeds pendulous from placenta, the right one showing the dorsal surface, × 30. C-E, *Pullea glabra*: C, fully mature flower, with 2 calyx lobes removed, the stamens fallen, × 20; D, pyrenes of young fruit, the left one with the ventral wall removed to show 4 young seeds pendulous from placenta, the right one showing the dorsal surface, × 30; E, young seed, × 70. A & B from *Tothill 472*, C & D from *L. K. Wade* (ANU 7638), New Guinea, E from *Clemens 11108 bis*, New Guinea.

TYPIIFICATION: The only specimen cited in Mueller's protologue was collected by Dallachy, and the only such material available to him in 1867 was *Dallachy* (MEL HOLOTYPE; fragment at K), collected in flower and fruit Aug. 12, 1866, along Murray's River, Rockingham Bay, Queensland, Australia. (The specimen need not be considered a lectotype, as indicated by Bange.) Another flowering specimen from the same locality, cited by Bange, is *Dallachy* (MEL), collected Nov. 10, 1869. *Mueller* (K, 2 sheets; fragments at L and P cited by Bange), from Rockingham Bay, should presumably not be considered part of the type.

DISTRIBUTION: As of the family. A second variety, with smaller leaves and fruits and with spicate inflorescences, is accepted by Bange.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Mbatiki, Nanduruloulou, cultivated, *B. E. V. Parham*, *Lam 6921* (L, cited by Bange).

In his note of 1939, cited above, Parham indicated that the species had been introduced in 1922 and was growing well on the property of W. L. Wallace on Tovu Island, Ra Province, Viti Levu. The same introduction was presumably established in the arboretum at Nanduruloulou, where it was shown to H. J. Lam by Parham in 1949.

FAMILY 119. PITTOSPORACEAE

PITTOSPORACEAE R. Br. in Flinders, *Voy. Terra Australis 2*: 542, as *Pittosporae*. 1814.

Trees or shrubs, sometimes scandent, estipulate, with schizogenous resin canals in vegetative parts, the indument when present composed of diverse types of few- or multicellular trichomes; leaves alternate (spirally arranged), often pseudoverticillate toward apices of branchlets, simple, the blades penninerved, often coriaceous, usually entire; inflorescences axillary, cauline, or terminal, simple or compound, few- to many-flowered or infrequently with solitary flowers, usually corymbose, cymose, or paniculate, bracteate; flowers actinomorphic (rarely zygomorphic), ♂ or functionally unisexual, pedicellate, often bibracteolate, usually 5-merous; calyx composed of free or variously connate sepals, these rarely spathaceous; corolla composed of 5 petals, these free or proximally connate or connivent, distally imbricate; stamens 5, hypogynous, erect, opposite sepals, the filaments filiform or subulate or linear, free or slightly connivent proximally, the anthers 2-locular, introrse, subdorsifixed to basifixed, dehiscing by longitudinal slits (rarely by apical pores); disk lacking; gynoecium 2 (infrequently 3-6)-carpellate, sessile or short-stipitate, the ovary superior, 1-locular or incompletely or completely 2(-6)-locular, the placentation parietal or sometimes axile, the ovules numerous, 2-seriate, anatropous, the style simple, the stigma small, thickened, capitate or lobed; fruit a berry or a loculicidal capsule, the seeds usually numerous, often immersed in viscid pulp, rarely winged, the endosperm copious, the embryo small.

DISTRIBUTION: Tropical and southern Africa (one species in Madeira and Canary Islands) and Madagascar through the Middle East to eastern Asia, Malesia, and Australia, eastward to New Zealand, Polynesia, and Hawaii, with eight or nine genera and about 240 species, and with a center of diversity in Australia. Only *Pittosporum*, the largest genus, occurs east of Australia and New Guinea.

USEFUL TREATMENTS OF FAMILY: BAKKER, K., & C. G. G. J. VAN STEENIS. *Pittosporaceae*. *Fl. Males. I*: 5: 345-362. 1957. HUTCHINSON, J. *Pittosporaceae*. *Gen. Fl. Pl.* 2: 294-298. 1967. CARLQUIST, S. *Wood anatomy of Pittosporaceae*. *Allertonia* 2: 355-392. 1981.

1. *PITTIOSPORUM* Banks ex Gaertn. *Fruct. Sem. Pl.* 1: 286. 1788; *Seem. Fl. Vit.* 7. 1865; Pritzel in Engl. & Prantl, *Nat. Pflanzenfam.* ed. 2. 18a: 273. 1930; Bakker in *Fl. Males. I*: 5: 345. 1957; Haas in *Allertonia* 1: 92. 1977.

Evergreen, erect, aromatic trees or shrubs with characters of the family; cataphylls (reduced bracteiform leaves) often numerous as scales around vegetative buds, at bases of peduncles, or scattered; inflorescences simple or with 2-4 main branches; flowers actinomorphic (rarely with a zygomorphic, spathaceous calyx), ♂ in all Fijian species (but often functionally unisexual elsewhere); petals basally valvate in bud, glabrous, proximally connivent or subconnivent at anthesis, distally imbricate and quincuncial, white to yellowish (as in our species) or rarely reddish to purplish, variably recurved at anthesis; anthers dehiscing by longitudinal slits; gynoeceium 2-carpellate (in our species, but rarely 3-6-carpellate elsewhere), the ovary 1-locular, pubescent (with 2-armed trichomes) or glabrous, the placenta median on each carpel; fruit a loculicidally dehiscent capsule, sometimes laterally and medianly (rarely suturally) compressed, the valves 2 (in our species, but sometimes 3-6 elsewhere), the exocarp coriaceous or woody-coriaceous and with a variable degree of external sculpturing, the endocarp fleshy, the funicles subglobose to peg-shaped or long and slender, the seeds numerous, 22-50 in our species (sometimes more or fewer elsewhere), irregularly angled and compressed, reddish or blackish, embedded in viscid resin, the seed mass usually filling capsule volume at maturity.

LECTOTYPE SPECIES: *Pittosporum tenuifolium* Gaertn. (vide Bullock in Kew Bull. 14: 44. 1960).

DISTRIBUTION: As of the family, with about 200 species. Five species (three of them endemic) occur in Fiji, and one species has been reported in cultivation.

USEFUL TREATMENT OF GENUS: HAAS, J. E. The Pacific species of *Pittosporum* Banks ex Gaertn. (*Pittosporaceae*). *Allertonia* 1: 73-167. 1977.

The present treatment is abstracted from the comprehensive 1977 work of Haas, in which all the Fijian species are to a degree illustrated. The five Fijian species fall into three evolutionary lines derived from a more westerly ancestry: (1) the *Pittosporum rhytidocarpum* group with two Fijian species (all the Hawaiian endemics are referred to this alliance by Haas), (2) the *P. arborescens* group with two Fijian species, and (3) the isolated species *P. brackenridgei*.

KEY TO SPECIES

Indigenous species.

Sepals free to base, (1.3-) 3.2-5.5 mm. long; corolla hypocrateriform, the petals rounded at apex, strongly recurved distally; capsules rostrate to subrostrate or acute at apex.

Leaves comparatively large, the petioles (8-) 17-40 (-50) mm. long, the blades narrowly obovate to oblanceolate or elliptic-lanceolate, (6-) 11-35 cm. long, (2-) 4-11 cm. broad, entire at margin, with 9-25 secondary nerves per side; inflorescences axillary (sometimes pseudoterminal), with 10-22 flowers; mature capsules strongly verrucose-sulcate to rugulose, the valves 18-39 × 14-38 mm., the seeds 40-50, 5-8 mm. long; indument composed of one trichome type (trichomes with a basal stalk and 2-armed terminal cell). 1. *P. rhytidocarpum*

Leaves smaller, the petioles (2-) 8-20 mm. long, the blades lanceolate or oblanceolate to narrowly elliptic or obovate, (3.5-) 6-16.5 cm. long, (1-) 2-4 cm. broad, entire to coarsely and remotely serrate distally, with (4-) 7-15 secondary nerves per side; inflorescences terminal, with 5-7 flowers; mature capsules minutely rugulose, the valves 30-33 × 18-20 mm., the seeds 22-28, 5.5-6.5 mm. long; indument composed of two trichome types (some trichomes with a basal stalk and 2-armed terminal cell, others uniseriate, glandular-capitate, and frequently moniliform).

2. *P. oligodontum*

Sepals variably connate; corolla narrowly campanulate, the petals laxly recurved at anthesis; capsules minutely rugulose, broadly acute to rounded at apex; inflorescences with 3-16 flowers; leaf blades (2-) 4-18 (-19) cm. long, 1.5-7 cm. broad, entire at margin; indument composed of one trichome type (trichomes with a basal stalk and 2-armed terminal cell).

Calyx cupuliform, with lobes rounded or broadly acute distally, splitting down one side at anthesis and then appearing patelliform, the sepals 1.5-3.3 mm. long, fused for 2/3-3/4 their length; flower buds narrowly ovoid-subellipsoid, rounded at apex; corolla broadly hypocrateriform, the petals 7-11 mm. long, 1.3-2.3 mm. at widest point, rounded at apex; mature capsules obovoid to ellipsoid (frequently transversely so), frequently compressed, the valves 13-30 mm. long, 11-21 mm. broad, the seeds 30-40, 4-5 mm. long; petioles 8-30 mm. long; leaf blades with 7-14 secondary nerves per side.

- Flowers about 6.5 mm. long at anthesis; sepals fused for approximately 2/3 their length; pericarp 3.5–6.2 mm. thick; leaf blades obovate to elliptic, rounded to broadly acute (rarely short-acuminate and mucronulate) at apex. 3. *P. arborescens*
- Flowers 8–10 mm. long at anthesis; sepals fused for approximately 3/4 their length; pericarp 1.8–3 mm. thick; leaf blades oblanceolate to narrowly obovate or elliptic, acute to mostly short-acuminate and mucronulate at apex. 4. *P. pickeringii*
- Calyx spatheaceous, 7–11 mm. long, completely enclosing mature flower buds, splitting down one side and frequently deciduous at anthesis, the sepals completely fused for their entire length; flower buds subconical, acute at apex; corolla narrowly campanulate, the petals 9.5–13 mm. long, 1.8–2 mm. broad at widest point, acute at apex; mature capsules subglobose to ovoid or transversely ellipsoid, the valves 17–32 mm. long and broad, the seeds 25–35, 3.5–4.5 mm. long; petioles (5–) 10–26 mm. long; leaf blades obovate-oblong to elliptic, rounded or rarely broadly acute or obtuse at apex, with 10–19 secondary nerves per side. 5. *P. brackenridgei*
- Cultivated species. 6. *P. phillyraeoides*

1. *Pittosporum rhytidocarpum* A. Gray, Bot. U. S. Expl. Exped. 1: 228. 1854, Atlas, pl. 18. 1856; Seem. in Bonplandia 9: 254. 1861, Viti, 434. 1862, Fl. Vit. 8, 1865, op. cit. 425. 1873; Drake, Ill. Fl. Ins. Mar. Pac. 111. 1890; Pax in Engl. & Prantl, Nat. Pflanzenfam. III. 2A: 111. 1891; Pritzel in op. cit. ed. 2. 18a: 277. 1930; J. W. Parham, Pl. Fiji Isl. 108. 1964, ed. 2. 154. fig. 47. 1972; Haas in Allertonia 1: 96. fig. 1, A, B, 3, A, B, 7. 1977.

A shrub or tree 2–10 m. high, often slender and cauliflorous, with abundant white latex, found in considerable abundance at elevations from near sea level to 1,195 m. in dense, open, or secondary forest, in thickets, and in open rocky places. The fragrant flowers have the corolla white or cream-white to dull yellow; the fruits are olive-green, becoming orange (especially within the valves), usually borne on branchlets below the leaves, and with black, sticky seeds. Flowers and fruits may occur throughout the year.

LECTOTYPIFICATION: Several Exploring Expedition specimens were examined by Gray, who cited the localities Viti Levu (north coast), Ovalau, and Vanua Levu (Mathuata). Haas in 1977 indicated *U. S. Expl. Exped. (US 7813 LECTOTYPE)*, collected in Fiji in 1840, although the precise locality cannot be stated. Other available *U. S. Expl. Exped.* specimens (GH, K, P, US 7812) are not necessarily isolectotypes, as the material came from several plants.

DISTRIBUTION: Endemic to Fiji and the most abundant species of the genus in the archipelago, being known from about 150 collections from nine islands, although it may be anticipated on many others.

LOCAL NAMES AND USES: The names most commonly applied to this species (and often used as generic in nature) are *nduva*, *nduvakalou*, *tuva*, *nduthi*, and *vothe*. Other locally noted names for *Pittosporum rhytidocarpum* are *mbau* (Waya), *saranga*, *taranga*, and *vothivothi* (Mba), *vothevothe ni thangi* (Tailevu), and *wailoa* and *samunggawe* (Thakaundrove); some of these are dubious. Like those of many other species of *Pittosporum*, the fruits are crushed and used as a fish poison, and they also provide a dye used in tattooing and for other purposes. An extract from the leaves and bark is said to be used medicinally in Ra, and in the Yasawas the larger trunks may be used for canoe-making.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Naruarua Gulch, west side of Mbatinaremba, *St. John 18050*. VITI LEVU: MBA: Northern portion of Mt. Evans Range, between Mt. Vatuyani and Mt. Natondra, *Smith 4356*; Mt. Koromba, *DA 14732*; vicinity of Nandarivatu, *Degener & Ordenez 13601*; slopes of Mt. Tomanivi, *Gillespie 4078*. NADRONGA & NAVOSA: Nausori Highlands, *O. & I. Degener 32157*; Thuvu, near Singatoka, *Greenwood 928*; northern portion of Rairaimatuku Plateau, *Smith 5495*. SERUA: Mt. Tuvutau, *DA 15530*; vicinity of Ngaloa, *Degener 15177*. NAMOSI: Mt. Naitarandamu, *Gillespie 3345*; summit of Mt. Vakarongasiu, *Gillespie 3269*; Nambukavesi Creek, *Damanu 80*. RA: Vicinity of Rewasa, near Vaileka, *Degener 15454*. NAITASIRI: Near Matawailevu, Wainimala River, *St. John 18190*; vicinity of Tamavua, *Gillespie 2413*. TAILEVU: Namara, *Seemann 52*; Raralevu road, *DA 5640*. REWA: Hills near Lami

quarry, *Gillespie 4601*. KANDAVU: Hills above Namalata and Ngaloa Bays, *Smith 150*; vicinity of Naikorokoro, *Damanu 48*. OVALAU: Hills east of Lovoni Valley, *Smith 7257*; Mt. Tana Lailai, *Graeffe*, Dec., 1864. VANUA LEVU: MBUA: Southern portion of Seatovo Range, *Smith 1541*; Nandi Bay, *Harvey*, Nov., 1855. MATHUATA: Southern base of Mathuata Range, north of Natua, *Smith 6789*; mountains near Lambasa, *Greenwood 607*. THAKAUNDROVE: Eastern drainage of Yanawai River, *Degener & Ordonez 1411*; southern slopes of Mt. Mariko, *Smith 413*. TAVEUNI: Vicinity of Wairiki, *Gillespie 4620*. KAMBARA: On limestone formation, *Smith 1253*. NAVUTU-I-LOMA: Central lowland forest, *Bryan 464*. ONGEA NDRIKI: Central forest, *Bryan 383*. CULTIVATED: Lyon Arboretum, Honolulu, Hawaii, *Ishikawa L-64-2242* (BISH).

This conspicuous species, which is fairly ubiquitous in Fiji, is readily recognized by its large leaves, large flowers with free sepals, and characteristic fruits, which are large, usually rostrate, and with valves that are usually very thick and characteristically strongly rugulose.

2. *Pittosporum oligodontum* Gillespie in Bishop Mus. Bull. **83**: 9, fig. 8. 1931; J. W. Parham, Pl. Fiji Isl. 108. 1964, ed. 2. 153. 1972; Haas in *Allertonia* **1**: 99, fig. 3, C, D, 5, A, 8, A-C. 1977.

A small tree, occasional in forest from near sea level to an elevation of about 750 m. No color notes are available, but flowers have been obtained in August and September, fruits in March and August.

TIPIFICATION: The type is *Gillespie 2329* (BISH HOLOTYPE; ISOTYPES at BISH, GH, K, NY, UC), collected Aug. 23, 1927, on the summit of Mt. Korombamba, Rewa Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and, as far as known, to Viti Levu.

LOCAL NAME: *Nduvakalou* has been recorded (*DA 1061*).

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Nandendeleva, Mt. Evans Range, *DA 14853*; Nauwangga, south of Nandarivatu, *Degener 14817*. SERUA: Bank of Navua River at Namata rapids, *Gillespie 2942*. TAILEVU: Vicinity of Korovou, *DA 1061*. REWA: Mt. Korombamba, on or near summit, *DA 1188, 1300*; Rewa without further locality, *DA 2574*. FIJI without further locality, *DA L13376*.

Pittosporum oligodontum, clearly allied to *P. rhytidocarpum*, has smaller leaves than its abundant relative, the blades being often (but not always) coarsely serrate distally; its inflorescences are terminal and few-flowered; and its capsules are generally smaller and only minutely rugulose. Its sparse indument, unlike that of other Fijian species, is composed of trichomes of two types, some hairs being glandular-capitate (cf. Haas, 1977, fig. 5, A) and others with a 2-armed terminal cell as in other Fijian species.

3. *Pittosporum arborecens* Rich ex A. Gray, Bot. U. S. Expl. Exped. **1**: 223. 1854; Seem. Viti, 433. 1862; Fl. Vit. 8. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 110. 1890; Pax in Engl. & Prantl, Nat. Pflanzenfam. III. **2A**: 111. 1891; Hemsl. in J. Linn. Soc. Bot. **30**: 169. 1894; Burkill in op. cit. **35**: 26. 1901; Pritzel in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **18a**: 277. 1930; Yuncker in Bishop Mus. Bull. **220**: 123. 1959; J. W. Parham, Pl. Fiji Isl. 108. 1964, ed. 2. 153. 1972; St. John & A. C. Sm. in Pacific Sci. **25**: 327. 1971; Haas in *Allertonia* **1**: 150, fig. 1, C, D, 18, A, B. 1977.

Pittosporum richii A. Gray, Bot. U. S. Expl. Exped. **1**: 224. 1854; Seem. Fl. Vit. 8, p. p. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 111. 1890; Pritzel in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **18a**: 277. 1930; J. W. Parham, Pl. Fiji Isl. 108. 1964, ed. 2. 154. 1972.

Pittosporum tobiroides sensu Seem. in Bonplandia **9**: 254. 1861; Viti, 434. 1862; A. Gray in Bonplandia **10**: 35. 1862; non A. Gray (1854).

Pittosporum brackenridgei sensu A. Gray in Proc. Amer. Acad. Arts **5**: 316. 1862; Seem. Fl. Vit. 8, p. p. 1865; non A. Gray (1854).

Pittosporum rhytidocarpum sensu Hemsl. in J. Linn. Soc. Bot. **30**: 169. 1894; Yuncker in Bishop Mus. Bull. **220**: 124. 1959; non A. Gray.

Pittosporum rarotongense Hemsl. in Cheeseman in Trans. Linn. Soc. Bot. **6**: 272. 1901; Pritzel in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **18a**: 277. 1930; Wilder in Bishop Mus. Bull. **86**: 53. 1931

A shrub or a tree (slender, spreading, or compact) 1–15 m. high, occurring from near sea level to an elevation of about 750 m. in dense or open forest or on its edges and frequently in coastal thickets. Its usually sparse latex is pale or colorless; its petals and filaments are white and its anthers yellow; and its capsules are green to yellow, usually with orange-red and sticky seeds. Flowers have been obtained between May and November, but fruits persist throughout much of the year.

LECTOTYPIFICATION AND NOMENCLATURE: *Pittosporum arborescens* was described by Gray on the basis of two Exploring Expedition collections, one from Tongatapu which Haas in 1977 designated as the holotype. A better citation is: *U. S. Expl. Exped.* (US 7796 LECTOTYPE; ISOLECTOTYPE at GH), obtained on Tongatapu, Tonga, in 1840. The second collection mentioned by Gray was a fruiting specimen from Fiji without further locality, but no such material with his annotation has been located. *Pittosporum richii* was also based on two collections; the lectotype (Haas, 1977) is *U. S. Expl. Exped.* (US 7815; ISOLECTOTYPE at GH), collected on Vanua Levu without precise locality in 1840. The second collection, from Fiji without further locality, is *U. S. Expl. Exped.* (GH, US 7814). In first combining these taxa of the same date, Haas utilized the first binomial. Also to be reduced to this concept is *P. rarotongense*, based on two Cheeseman specimens from Rarotonga, between which Haas in 1977 selected *Cheeseman*, July, 1899 (K LECTOTYPE); *Cheeseman* 507 (K) is a paratype.

DISTRIBUTION: Fiji, Horne Islands (Alofi), Tonga (at least six islands), and Cook Islands (Rarotonga, Mauke). The species is abundant in Tonga and in the Lau Group of Fiji, also occurring on the larger Fijian islands but less commonly than *P. rhytidocarpum* and *P. pickeringii*. About 50 Fijian collections are at hand, from 14 different islands.

LOCAL NAMES AND USE: Names recorded in Lau are *tuvakalou*, *nduvakalou*, and *nduva nganga* (bitter); a report of the name *nggaringgarikalavu* in Thakaundrove seems doubtful. The fruits are crushed, boiled, and used as a fish poison, like those of other species of *Pittosporum*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Korovou, east of Tavua, *Degener* 14939; vicinity of Nandarivatu, *Degener* 14464. NANDRONGA & NAVOSA: Thuvu, west of Singatoka, *Greenwood* 892B; vicinity of Nakambuta, north of Singatoka, *H. B. R. Parham* 293a. SERUA: Vicinity of Ngaloa, *Watkins* 766. RA: Vicinity of Rewasa, near Vaileka, *Degener* 15431. TAILEVU: Singh's farm, Tailevu North, *DA* 13583; near Londoni, *DA* 14422. NAITASIRE: Near Savu, Waindina River, *DA* 2617. VITI LEVU without further locality, *Seemann* 56. MBENGGGA: Waisomo, *DA* 13723. KANDAVU: Naikorokoro, *DA* 12446, p. p. (*DF* 92); Nangingia Island, *DA* 14959. OVALAU: Slopes of Mt. Koronimoko, vicinity of Thawathi, *Smith* 8067; vicinity of Levuka, *Gillespie* 4464. NAIRAI: *DA* 1010. NGAU: Shore of Herald Bay, vicinity of Sawaieke, *Smith* 7912. VANUA LEVU: MBUA: Liuka flat, Nasau, Rukuruku Bay, *H. B. R. Parham* 7; between Mbua and Ndama, *DA* 1124. MATHUATA: Mbatiri, Ndreketi River, *DA* 13901. TAVEUNI: Vicinity of Waiyevo, *Gillespie* 4744; summit and adjacent slopes of Mt. Manuka, east of Wairiki, *Smith* 8219. MATUKU: *Milne* 122. KANATHEA: *Graeffe* 1544. THITHIA: Nakoro, *DA* 13251. LAKEMBA: Between Yandrana and Vakano, *Garnock-Jones* 946. KAMBARA: *Moore* 33. FULANGA: On limestone formation, *Smith* 1129.

4. *Pittosporum pickeringii* A. Gray, Bot. U. S. Expl. Exped. 1: 227. 1854; Seem. in Bonplandia 9: 254. 1861, Viti, 434. 1862; A. Gray in Proc. Amer. Acad. Arts 5: 315. 1862, in Bonplandia 10: 35. 1862; Seem. Fl. Vit. 8, p. p. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 111. 1890; Pax in Engl. & Prantl, Nat. Pflanzenfam. III. 2A: 111. 1891; Pritzl in op. cit. ed. 2. 18a: 277. 1930; J. W. Parham, Pl. Fiji Isl. 108. 1964, ed. 2. 154. 1972; Haas in Allertonia 1: 154. fig. 4, F, 6, D, 17, D. 1977.

Pittosporum brackenridgii sensu Seem. in Bonplandia 9: 254, as *P. brackenridgii*. 1861, Viti, 433. 1862; A. Gray in Proc. Amer. Acad. Arts 5: 315. 1862, in Bonplandia 10: 35. 1862; Gibbs in J. Linn. Soc. Bot. 39: 140. 1909; non A. Gray (1854).

Pittosporum richii sensu Seem. Fl. Vit. 8, p. p. 1865; non A. Gray.

Pittosporum nadarivataense Gibbs in J. Linn. Soc. Bot. 39: 140. 1909; J. W. Parham, Pl. Fiji Isl. 108. 1964, ed. 2. 153. 1972.

An often slender tree 3–20 m. high, with thin, colorless latex, occurring from near sea level to the highest elevation in Fiji, 1,323 m., in dense, dry, or open forest, in the forest-grassland transition, or in dense crest thickets. The fragrant flowers, pale green in bud, have white to pale yellow petals; the capsules turn from green to black at maturity and have sticky seeds varying from black to bright red. Flowers and fruits are seen throughout the year.

TIPIFICATION AND NOMENCLATURE: The type is *U. S. Expl. Exped.* (us 7808 HOLOTYPE; fragmentary ISOTYPE at GH), collected in 1840 in Fiji without a definite locality. Gibbs assigned two numbers collected in August, 1907, in the vicinity of Nandarivatu, Mba Province, Viti Levu, to *Pittosporum nadarivataense*; of these Haas in 1977 indicated *Gibbs 581* (BM LECTOTYPE; ISOLECTOTYPE at K); no. 577 bis (BM, K) consists of fragments mixed with no. 581. Gibbs's material is not distinguishable from other specimens obtained in north-central Viti Levu, where *P. pickeringii* is particularly abundant.

DISTRIBUTION: Endemic to Fiji and now known from eight of the islands and about 85 collections.

LOCAL NAMES AND USES: In addition to the commonly used names *nduva*, *nduvakalou*, *tuva*, and *tuvakalou*, locally recorded names are *taranga*, *saranga*, *tuva ni nduna*, *mundu*, *mariko*, and *sinu* (Mba), *tuva lailai*, *nggalaka*, and *taranga* (Nandronga & Navosa), and *wailangio* (Koro). As is the case with other species, the fruits are crushed and boiled and the resulting liquid is used as a fish poison; leaves crushed in water are said to provide a remedy for stomach troubles.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mangondro Tikina, *DA 14902*; foot of Koro Levu, north of Waikumbukumbu, *Gibbs 765*; vicinity of Nandarivatu, *Parks 20730*; summit of Mt. Tomanivi, *Smith 5910*. NANDRONGA & NAVOSA: Nausori Highlands, *Vetawa 9*; northern portion of Rairaimatuku Plateau, *Smith 5413*; vicinity of Nathotholevu, north of Singatoka, *H. B. R. Parham 105*. SERUA: Nathengathenga Creek, upper Navua River, *DA 14270*; vicinity of Ngaloa, *DA 14119*; hills between Navua River and Wainiyavu Creek, near Namuamua, *Smith 8988*. NAMOSE: Nakavika, *DA 11624*; track to Mt. Vakarongasiu, *DA 17603*. RA: Tuvavatu, vicinity of Rewasa, *Degener 15384*. NAITASIRE: Namboubutho Creek, *Horne 989*; Waindina River basin, *MacDaniels 1055*; Suva Pumping Station, *Degener & Ordenez 13781*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7146*; vicinity of Ngegelekuro, *DA 13596*. REWA: Between Suva and Lamu, *Gillespie 2075*. KANDAVU: Hills above Namalata and Ngaloa Bays, *Smith 54*. OVALAU: *Seemann 55*; summit of Mt. Ndelaiovalau and adjacent ridge, *Smith 7558*. KORO: Eastern slope of main ridge, *Smith 1065*. NAIRAI: *Milne 185*. VANUA LEVU: MBUA: Southern portion of Seatovo Range, *Smith 1539*. MATHUATA: Wainikoro River, *Greenwood 707*. TAVEUNI: *Seemann 53*; vicinity of Wairiki, *Gillespie 4677*. KAMBARA: Central wooded basin, *Bryan 505*.

Pittosporum pickeringii is distinguished from *P. arborescens* by its larger flowers with more highly connate sepals, and by having its leaf blades usually short-acuminate and mucronulate at apex, rather than predominantly rounded to broadly acute. The capsules of the two species are quite similar, those of *P. arborescens* being on the average slightly the larger and with a substantially thicker pericarp. *Pittosporum arborescens* is frequently coastal in habitat and is the more frequent of the two species in Lau, also extending eastward. On the larger Fijian islands *P. pickeringii* is the more frequent, especially in inland and higher elevation forest.

5. *Pittosporum brackenridgei* A. Gray, Bot. U. S. Expl. Exped. 1: 225. 1854, Atlas, pl. 17, A. 1856; Seem. Fl. Vit. 8, p. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 110. 1890; Pax in Engl. & Prantl, Nat. Pflanzenfam. III. 2A: 111. 1891; Hemsl. in J. Linn. Soc. Bot. 30: 169. 1894; Pritzel in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 18a: 277. 1930; A. C. Sm. in Bishop Mus. Bull. 141: 73. fig. 37. 1936; Yuncker in op. cit.

178: 58. 1943, in op. cit. **220:** 124. 1959; J. W. Parham, Pl. Fiji Isl. 108. 1964, ed. 2. 153. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200:** 169. 1970; Haas in Allertonia **1:** 161. *fig. 4, G, 6, E, 20.* 1977.

Pittosporum tobiroides A. Gray, Bot. U. S. Expl. Exped. **1:** 226. 1854, Atlas, *pl. 17. B.* 1856; Seem. Fl. Vit. **8:** 1865; Drake, Ill. Fl. Ins. Mar. Pac. **111:** 1890; Pritzel in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **18a:** 277. 1930.

Pittosporum spathaceum Burkill in Hook. Icon. Pl. **26:** *pl. 2561.* 1898, in J. Linn. Soc. Bot. **35:** 26. 1901; A. C. Sm. in Bishop Mus. Bull. **141:** 73. 1936; Yuncker in op. cit. **220:** 124. 1959.

A tree 4–25 m. high, with thin, yellowish latex, found from near sea level to an elevation of about 750 m. in open or dry forest, hillside thickets, and in beach thickets. The petals are white or cream-white to yellowish, and the capsules turn from green to yellowish or black, with black to reddish seeds. In Fiji flowers have been collected only in April and December, but fruits have been obtained in most months.

TYPIFICATION AND NOMENCLATURE: The type of *Pittosporum brackenridgei* is *U. S. Expl. Exped.* (US 7798 HOLOTYPE; ISOTYPE at GH), collected in 1840 in Mathuata Province (probably on Mathuata Island), Vanua Levu; that of *P. tobiroides* is *U. S. Expl. Exped.* (US 7825 HOLOTYPE; ISOTYPE at GH), obtained in 1840 near Somosomo, Taveuni; and that of *P. spathaceum* is *Crosby 22*, p. p. (K HOLOTYPE), from Vava'u, Tonga. The two Gray taxa were apparently first combined by me in 1936 under the name *P. brackenridgei*; both type collections are in fruit and differ only insignificantly. The type of *P. spathaceum* has somewhat shorter petioles, a fewer-flowered inflorescence than Fijian collections, and comparatively long pedicels, but the material now available indicates that these characters are not consequential.

DISTRIBUTION: Fiji, Tonga, and Niue; although it has now been obtained on seven different Fijian islands, it is nowhere abundant, 25 collections being known. In Tonga it appears to be uncommon, but on Niue it is said to be frequent (Sykes, 1970, cited above).

LOCAL NAMES AND USES: In addition to the usual names *nduva* and *tuva*, the names *konakona* (Mba), *nduvakora* (Ra), and *mbau* (Thakaundrove) have been recorded. As with other species of *Pittosporum* in Fiji, the fruits are used as a fish poison; the wood is locally considered useful for boat-making and flooring.

REPRESENTATIVE COLLECTIONS: YASAWAS: YASAWA: *DA L.10920* (coll. C. Walker). WAYA: Nakawa Gulch, west of Mbatinaremba, *St. John 18145*. VITI LEVU: MBA: Saweni Beach, near Lautoka, *Greenwood 892*; north of Natalau, between Lautoka and Nandi, *Degener 14998*; valley of Namosi Creek, vicinity of Tumbenasolo, *Smith 4617*; slopes of escarpment north of Nandarivatu, *Smith 6039*. RA: Mataimeravula, vicinity of Rewasa, near Vaileka, *Degener 15332*. OVALAU: *Graeffe 1556*; north of Levuka, *Gillespie 4556*. MAKONDRONGA: *Degener & Ordonez 13808*. VANUA LEVU: MATHUATA: Vicinity of Nanduri, *Tothill F433*; vicinity of Lambasa, *Greenwood 558*; Mt. Numbuloa, east of Lambasa, *DA 14642*. THAKAUNDROVE: Nukulekaleka Island (Vuya Tikina, east of Rokothivia Bay), *DA 13173*; hills west of Mbutha Bay, Natewa Peninsula, *Smith 818*.

The flowers of *Pittosporum brackenridgei*, which have a large, spathaceous calyx and comparatively long petals and filaments, immediately distinguish it from *P. arborescens*, which it resembles in foliage and fruit. In general, the leaf blades of *P. brackenridgei* are the more definitely rounded (or even retuse) at apex, and the mature capsules are more frequently transversely ellipsoid; both species have capsules with very thick pericarps in comparison with *P. pickeringii*.

Pittosporum sect. *Spathicalyx* (A. C. Sm. in Bishop Mus. Bull. **141:** 73. 1936) has been proposed to include *P. brackenridgei* and *P. spathaceum* (now considered a synonym). As indicated by Haas (1977, p. 164), a similar trend toward development of a spathaceous calyx occurs in at least one African species, suggesting that a section

based on this sole character would be phylogeographically untenable. When a world-wide review of *Pittosporum* is undertaken, it is likely that a large number of small groupings (such as the sections distinguished for the Papuan species by Schodde in Austral. J. Bot. Suppl. 3: 1-60. 1972) will provide reliable criteria for natural infrageneric taxa.

6. *Pittosporum phylliraeoides* DC. Prodr. 1: 347, as *P. phylliraeides*. 1824; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 116. 1939.

No herbarium vouchers seem to support the cultivation of this Australian species in Fiji, but Parham indicates that it was introduced in 1924 and in 1939 was growing slowly on the property of W. L. Wallace, Tovu Island, Ra Province, Viti Levu. The holotype is a fruiting specimen, *Leschenault* (G), the species being widespread in Australia.

FAMILY 120. CRASSULACEAE

CRASSULACEAE DC. in Lam. & DC. Fl. Franç. ed. 3. 4 (1): 382. 1805.

Mostly perennial and xerophilous herbs or low shrubs, estipulate, usually with succulent stems and leaves; leaves alternate, opposite, or whorled, the blades often simple but sometimes pinnately compound, entire to crenate or dentate; inflorescences usually cymose; flowers actinomorphic, ♂ or rarely unisexual, often protandrous; sepals frequently 4 or 5 (sometimes 3-32), free or united into a tube, persistent; petals as many as sepals, hypogynous or shallowly perigynous, free or variously connate; stamens usually as many as or twice as many as petals, hypogynous or epipetalous, if few then alternate with petals, the filaments free or occasionally basally connate, the anthers introrse, basifixed, 2-locular, longitudinally dehiscent; gynoecium composed of superior carpels as many as petals, the carpels free or basally connate, each usually subtended by a glandular scale, the ovules usually numerous, rarely few or solitary, anatropous, the placentation marginal or laminar, the styles short or elongated, the stigmas capitate or inconspicuous; fruit a follicetum, often surrounded by the persistent perianth, the follicles usually adaxially dehiscent, the seeds minute, the endosperm fleshy and scant, rarely none, the embryo straight.

DISTRIBUTION: Warm or temperate parts of both hemispheres, usually occurring in dry, rocky places, with about 35 genera and 1,500 or more species. Only one species, now widespread, is established in Fiji, but others are doubtless grown in private gardens. The family includes many ornamentals and succulent horticultural novelties.

USEFUL TREATMENT OF FAMILY: BACKER, C. A. Crassulaceae. Fl. Males. 1. 4: 197-202. 1951.

1. *KALANCHOË* Adanson, Fam. Pl. 2: 248. 1763.

Bryophyllum Salisb. Parad. Lond. t. 3. 1805.

Perennial, succulent herbs or infrequently shrubs, often gemmiparous and viviparous; leaves opposite and decussate or in whorls of three, usually simple, the blades often with adventitious buds in marginal crenations; inflorescences corymbose or paniculate cymes; flowers pedicellate, 4-merous; sepals connate, forming an inflated calyx tube; petals connate, forming a cylindric to campanulate tube with spreading to recurved lobes; stamens 8 (rarely 4), epipetalous and usually 2-seriate and exserted, the filaments slender; carpels 4, connate basally, the ovules numerous, borne on adaxial placentas, the style slender; follicles enclosed by the marcescent calyx and corolla, the seeds numerous.

TYPE SPECIES AND NOMENCLATURE: The type species of *Kalanchoë* is *K. laciniata* (L.) DC. (*Cotyledon laciniata* L.); that of *Bryophyllum* is *B. calycinum* Salisb. *Bryo-*

phyllum is now most frequently included in *Kalanchoë* (e. g. Backer, 1951, cited above, p. 198; Lawrence, Tax. Vascular Pl. 531. 1951; Schulze-Menz in Melchior, Engl. Syll. Pflanzenfam. ed. 12. 2: 200. 1964; Spongberg in J. Arnold Arb. 59: 238. 1978).

DISTRIBUTION: Africa and Madagascar to tropical Asia, with 125–200 species.

J. W. Parham (Pl. Fiji Isl. 230. 1964, ed. 2. 319. 1971) has noted, in addition to the well-established species listed below, two additional species of *Bryophyllum* that have been observed in gardens in Fiji, but no herbarium vouchers are available. These are the species now known as *Kalanchoë tubiflora* (Harvey) Raym.-Hamet and *K. daigremontiana* (Raym.-Hamet & H. Perrier) A. Berger, both indigenous in Madagascar and widely grown as pot plants.

1. *Kalanchoë pinnata* (Lam.) Pers. Syn. Pl. 1: 446. 1805; Backer in Fl. Males. I. 4: 199. fig. 1. 1951.

Cotyledon pinnata Lam. Encycl. Méth. Bot. 2: 141. 1786.

Bryophyllum pinnatum Kurz in J. Asiat. Soc. Bengal 40: 52. 1871; Christophersen in Bishop Mus. Bull. 128: 95. 1935; A. C. Sm. in Sargentia 1: 35. 1942; Yuncker in Bishop Mus. Bull. 178: 57. 1943; Greenwood in Proc. Linn. Soc. 154: 98. 1943, in J. Arnold Arb. 30: 76. 1949; Yuncker in Bishop Mus. Bull. 220: 123. 1959; J. W. Parham in Dept. Agr. Fiji Bull. 35: 43. fig. 16. 1959, Pl. Fiji Isl. 230. 1964, ed. 2. 319. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 75. 1970.

A succulent herb, sometimes shrubby, 0.3–2 m. high, often forming colonies, occurring from near sea level to an elevation of 550 m. as a weed of waste places and cultivated fields and along roadsides, naturalized on rocky coasts and slopes and sometimes in dry forest. The hollow stems bear leaves that are at first simple, on mature plants 3- or 5-foliolate and producing plantlets in the marginal crenations. The large, paniculiform inflorescences have flowers with an inflated, papery, greenish white to purple-tinged calyx; the corolla is green, rich pink to purple distally and slightly exceeding the calyx; and the stamens have pale green, distally pinkish filaments. Flowers and fruits may be found at any season.

TYPIFICATION: The type is *Sonnerat* (P), from Ile de France (Mauritius), Mascarene Islands.

DISTRIBUTION: Probably indigenous in tropical Africa, but early introduced into and now widespread in the tropics and subtropics of both hemispheres.

LOCAL NAMES AND USES: The frequent English names are *air plant*, *life plant*, and *Canterbury bells*; the Fijian name *thakomana* or *thakamana* has been recorded. The species is sometimes cultivated in gardens. The leaves are widely used medicinally (Burkill, Dict. Econ. Prod. Malay Penins. ed. 2. 380. 1966), although in Fiji this has not been noted.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Naloto Range, DA 14779; Tavua, Greenwood 782. NANDRONGA & NAVOSA: Queen's Road near Thuvu, DA 10270; near Saru, Tamanua Creek, Tabualewa 15618. RA: Yanggara, DA 11862. NAITASIRI: Central Road, H. B. R. Parham 11. REWA: Suva, in Department of Agriculture Botany Laboratory garden, DA 11045. VANUA LEVU: THAKAUNDOVE: Near Mbutha, Mbutha Bay, Natewa Peninsula, DA 16878. TAVEUNI: Vicinity of Waiyevo, Smith 8109. THITHIA: Bryan 561.

ORDER ROSALES

KEY TO FAMILIES OCCURRING IN FIJI

Flowers actinomorphic; gynoecium usually apocarpous and superior, rarely syncarpous or inferior, the ovules pendulous, the styles free or rarely connate, terminal or lateral but never gynobasic; fruit various (in our genera pomaceous or an aggregate of achenes or drupelets); leaves simple or compound.

121. ROSACEAE

Flowers zygomorphic (except in *Chrysobalanus* among our genera); gynoecium basically composed of 3 carpels (but usually only 1 developing), superior, the ovules erect, the style filiform, gynobasic; fruit a drupe; leaves simple. 122. CHRYSOBALANACEAE

FAMILY 121. ROSACEAE

ROSACEAE Juss. Gen. Pl. 334. 1789.

Trees, shrubs, or (usually perennial) herbs, sometimes straggling or climbing; stipules usually present and paired, often adnate to petioles; leaves alternate or very rarely opposite, simple or compound; inflorescences usually corymbose, racemose, or paniculate, sometimes 1-flowered; flowers actinomorphic, ♂, rarely unisexual, the perianth usually dichlamydeous and perigynous, basally forming a hypanthium, seldom epigynous or nearly hypogynous; calyx free or adnate to ovary, the lobes mostly 5, usually imbricate; disk intrastaminal, lining the hypanthium; petals the same number as calyx lobes, usually imbricate; stamens numerous (usually at least twice as many as petals, seldom fewer), perigynous around gynoecium, the filaments free, the anthers small, didymous, 2-locular, longitudinally dehiscent; gynoecium usually apocarpous and superior, rarely syncarpous or inferior, the carpels 1-many, free to completely connate, the ovules often 2 (rarely 1-several) per carpel or ovary locule, pendulous, superposed, anatropous, the placentation axile, the styles free or rarely connate, terminal or lateral (never gynobasic), the stigmas capitate or punctiform; fruit superior or inferior, drupaceous, pomaceous, follicular, or achenial, very rarely capsular, the seeds without or with scant endosperm, the embryo small.

DISTRIBUTION: Cosmopolitan but most abundantly north temperate, with about 100 genera and 2,000-3,000 species. The family is of great economic importance, especially in temperate areas, producing many well-known edible fruits and ornamentals. Four genera, each represented by a single species, are recorded from Fiji, only one of them (*Rubus*) being indigenous.

USEFUL TREATMENTS OF FAMILY: SCHULZE-MENZ, G. K. Rosaceae. In: Melchior, H. Engl. Syll. Pflanzenfam. ed. 12. 2: 209-218. 1964. HUTCHINSON, J. Rosaceae (excl. Neuradeae, Chrysobalanaceae). Gen. Fl. Pl. I: 174-216. 1964.

KEY TO GENERA

- Gynoecium apocarpous, the carpels numerous, sometimes enclosed within the hypanthium but not adnate to it; fruit an aggregate of achenes or drupelets.
- Hypanthium with an apical epicalyx of bracteoles alternating with calyx lobes; receptacle in fruit greatly enlarged, juicy, bearing numerous, minute achenes; leaves usually 3-foliolate; our species a cultivated, rhizomatous, stoloniferous herb. 1. *Fragaria*
- Hypanthium without an apical epicalyx; erect or scandent shrubs.
- Leaves usually imparipinnately compound, in our species with 5-9 leaflets; hypanthium subglobose or urceolate, enclosing the ovaries and ripe fruits; our species a cultivated, ornamental, erect shrub. 2. *Rosa*
- Leaves (of our species) simple; hypanthium flat or shallowly campanulate, the receptacle conical in fruit and bearing small drupelets; our species an indigenous scrambling vine or scandent shrub. 3. *Rubus*
- Gynoecium syncarpous, the ovary inferior, (2-)-5-locular, the styles (2-)-5; leaves simple; fruit a pome; our species a cultivated small tree. 4. *Eriobotrya*

1. FRAGARIA L. Sp. Pl. 494. 1753.

Rhizomatous herbs, sometimes polygamodioecious, usually stoloniferous, with a short main stem, the stipules partly adnate to petioles; leaves radical or alternate, compound, usually 3-foliolate, the leaflet blades pinnate-nerved, dentate; inflorescences cymose or with solitary flowers; flowers 5-merous, the hypanthium turbinate or obconical, at apex bearing an epicalyx of bracteoles alternating with calyx lobes, these persistent, the disk pilose; petals white (as in our species) or yellow; stamens numerous, 1- or 2-seriate, persistent; gynoecium apocarpous, the carpels numerous on a convex receptacle, each with a solitary ovule, the styles ventral; aggregate fruits composed of numerous, minute achenes borne on an enlarged, juicy receptacle.

LECTOTYPE SPECIES: *Fragaria vesca* L. (vide Rydberg in N. Amer. Fl. 22: 356. 1908), one of Linnaeus's three original species.

DISTRIBUTION: Eurasia, Indo-Malesia, North America, and southern South America, with about 15 species and many cultivated hybrids. One cultivated taxon is recorded from Fiji.

1. *Fragaria* × *ananassa* Duchesne, Nat. Hist. Frais. 190. 1766.

Fragaria vesca sensu J. W. Parham, Pl. Fiji Isl. ed. 2. 94. 1972; non L.

A cultivated, sprawling herb, sparingly cultivated near sea level (and also reported from about 750 m.), with white petals. The only available collection was flowering in December.

TYPIIFICATION: Duchesne's citation of "Mill. fig. t. 1. p. 192" refers to Philip Miller, Fig. Pl. Gard. Dict. 2; pl. 288 (opp. p. 192). (June) 1759.

DISTRIBUTION: *Fragaria* × *ananassa* is considered a hybrid between the American *F. chiloensis* (L.) Duchesne and *F. virginiana* Duchesne and is very widely cultivated. Parham (1972) indicates that the *Fragaria* recorded in Fiji was introduced many years ago and was grown at Nandarivatu and occasionally in lowland gardens.

LOCAL NAME AND USE: *Strawberry*; widely grown commercially for its edible fruit, although it is probably not productive in Fiji at least at low elevations.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRE: Koronivia, DA 4032.

The cited collection was cultivated in fodder plots at an agricultural station; it seems better referred to *Fragaria* × *ananassa* than to *F. vesca* (distinctions indicated by Backer and Bakhuizen van den Brink, Jr., Fl. Java 1: 517-518. 1963). In the Pacific *F.* × *ananassa* is also known from Hawaii, the Austral Islands, and Pitcairn, as well as Indonesia.

2. *Rosa* L. Sp. Pl. 491. 1753.

Erect, climbing, or sprawling shrubs, usually with aculeate branches, the stipules adnate to base of petiole (rarely absent); leaves alternate, usually imparipinnately compound with 5 or more leaflets (rarely simple); inflorescences terminal or on short lateral branches, corymbose or 1-flowered; flowers usually with a subglobose or urceolate hypanthium; calyx lobes 5 (rarely 4), imbricate in bud, sometimes foliaceous or pinnatisect; petals 5 (or 4, or many more in cultigens), spreading, imbricate, usually white to yellow or red; disk thickened at annular apex; stamens numerous, several-seriate, the filaments filiform; gynoecium apocarpous, the carpels numerous, included by the hypanthium, the ovules 1 or 2 per carpel, the styles exerted from hypanthium, free or distally coherent; fruits achenial, 1-seeded, included by the fleshy, colored, fruitlike hypanthium (hip).

LECTOTYPE SPECIES: ING (1979) indicates as the lectotype species *Rosa centifolia* L. (vide Britton & Brown, Ill. Fl. N. U. S. ed. 2. 2: 282. 1913), one of the twelve original species. However, G. D. Rowley (in Taxon 25: 181. 1976) had pointed out that *R. centifolia* is a double-flowered cultivar of unknown origin and is not a suitable lectotype species; he recommends selecting *R. cinnamomea* L.

DISTRIBUTION: North temperate areas and tropical uplands, with 200-250 species and innumerable hybrids and cultivars, of which one or perhaps many have been grown in Fiji.

1. *Rosa damascena* Mill. Gard. Dict. ed. 8. 1768; J. W. Parham, Pl. Fiji Isl. 61. 1964, ed. 2. 95. 1972.

An erect, robust, aculeate shrub to 2 m. high, with 5-9-foliolate leaves, cultivated near sea level. The very fragrant flowers have the pedicels and calyces with glandular bristles; the petals are red or rarely white.

TYPIFICATION: Miller cited "Lob. Icon. 206," presumably referring to Lobelius (M. de L'Obel), Pl. Icon., 1581.

DISTRIBUTION: Indigenous in western Asia, now widely cultivated.

LOCAL NAME AND USE: *Damask rose*; ornamental.

No herbarium vouchers support this record, but perhaps this popular cultigen was introduced by J. B. Thurston (cf. Vol. 1 of this *Flora*, pp. 47, 87), as it was among the three species of *Rosa* listed in his *Catalogue*. Probably other species are now growing in private gardens in Fiji, but *R. damascena* is the only one recorded by Parham; it has been noted in the Pacific at least on Guam and in Hawaii, and it is doubtless often cultivated in Indonesia (cf. Backer & Bakh. f. Fl. Java 1: 520. 1963).

3. *RUBUS* L. Sp. Pl. 492. 1753; Seem. Fl. Vit. 75. 1865; van Royen in Phanerogam. Monogr. 2: 11. 1969.

Shrubs or scrambling vines, infrequently creeping, the stipules adnate to petiole, entire or divided; leaves alternate, simple, lobed, or digitately (rarely pinnately) compound, the blades usually strongly serrate; inflorescences terminal or axillary, corymbose, paniculate, or 1-flowered; flowers ♂ or sometimes unisexual, the hypanthium flat or shallowly campanulate, the calyx lobes 5, persistent, the disk nectariferous, the petals 5; stamens numerous (staminodial in ♀ flowers), the filaments filiform; gynoecium apocarpous, the carpels usually numerous, rarely few, borne on a usually convex receptacle, the ovules 2 per carpel, the styles subterminal, filiform; fruit an aggregate of drupelets, these crowded on the dry receptacle, 1-seeded, red to yellow or black.

LECTOTYPE SPECIES: *Rubus fruticosus* L. (vide Britton & Brown, Ill. Fl. N. U. S. ed. 2: 275. 1913), one of Linnaeus's ten original species.

DISTRIBUTION: Essentially cosmopolitan but especially in north temperate areas, with 200–250 species and many cultivars. One species is indigenous in Fiji.

USEFUL TREATMENT OF GENUS: ROYEN, P. VAN. The genus *Rubus* (Rosaceae) in New Guinea. Phanerogam. Monogr. 2: 1–126. 1969.

1. *Rubus moluccanus* L. var. *austropacificus* van Royen in Phanerogam. Monogr. 2: 113, as var. *austropacifica*. fig. 30. 1969. FIGURE 8.

Rubus tiliaceus sensu A. Gray, Bot. U. S. Expl. Exped. 1: 503. 1854; Seem. in Bonplandia 9: 255. 1861, Viti, 436. 1862, Fl. Vit. 76. 1865, op. cit. 427. 1873; Drake, Ill. Fl. Ins. Mar. Pac. 162. 1890; non Sm.

Rubus moluccanus sensu J. W. Parham in Dept. Agr. Fiji Bull. 35: 79. 1959, Pl. Fiji Isl. 61. 1964, ed. 2. 95. 1972; non sensu var. *moluccanus*.

A scrambling, thorny vine or liana or a scandent shrub, with simple leaves of which the blades are shallowly 3- or 5-lobed and often acuminate, sometimes locally abundant from near sea level to an elevation of 1,100 m., on forest edges or in secondary forest or thickets. The petals, filaments, and styles are white, the anthers yellow, and the ripe fruits red. Flowers and fruits are seen at all seasons.

TYPIFICATION: The type of *Rubus moluccanus* var. *austropacificus* is van Royen 16444 (L HOLOTYPE), collected July 4, 1963, near Tuareruku Village, west of Toiumonapu Plantation, south of Kieta, Bougainville, Solomon Islands.

DISTRIBUTION: *Rubus moluccanus* L. (typified by *R. moluccus latifolius* Rumph. Herb. Amb. 5: 88. t. 47, fig. 2. 1747) as a whole has a distribution ranging from the Himalayas through Malesia to New South Wales in Australia and eastward to Fiji. As treated by van Royen in 1969 (pp. 98–115), the species is composed of four varieties; var. *austropacificus* extends from the Caroline Islands, New Britain, the Solomon Islands, and northern Australia to New Caledonia and Fiji. The variety is abundant in Fiji, being known from some 45 collections and seven islands (doubtless also occurring

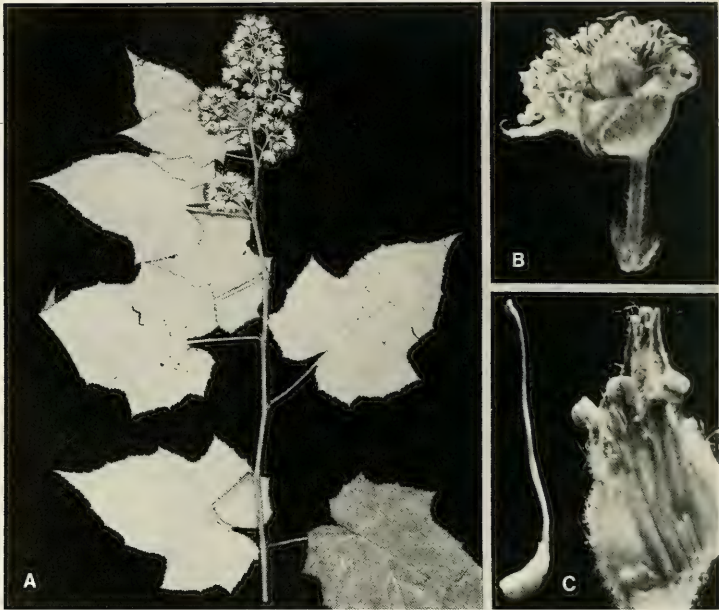


FIGURE 8. *Rubus moluccanus* var. *austropacificus*; A, distal portion of branchlet, with foliage and inflorescence, $\times 1/3$; B, flower, $\times 4$; C, stamens, a calyx lobe showing lacinate apex, and a carpel, $\times 10$. A from Smith 1746, B & C from Smith 554.

on others). Although it sometimes gives the appearance of being an introduction because it is often found in secondary habitats, it is probably indigenous in Fiji, having been first collected between 1840 and 1860 at widely separated localities by the U. S. Exploring Expedition, Milne, MacGillivray, Harvey, and Seemann. No record of its occurrence in Samoa or Tonga has been noted.

LOCAL NAMES AND USES: The frequently used Fijian names are *soni*, *wa sori*, and *wangandrangandro*; *wa votovotoa* and *wa vuka* have been more locally noted. English names are *wild raspberry* and *wild bramble*. The fruit is edible but somewhat tasteless; it has a reputed medicinal use of causing constipation.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, *Degener & Ordenez 13519*; western slope of Mt. Nanggaranambuluta, *Smith 4835*. NANDRONGA & NAVOSA: Uluvatu, vicinity of Mbalo, near Vatukarasa, *Tabualewa 15631*. SERUA: Ndeumba, *DA 9198 (McKee 2761)*. NAMOSI: Valley of Wainambua Creek, south of Mt. Naitarandamu, *Smith 8760*; slopes of Mt. Voma, *Gillespie 2483*. NAITASIRI: Vicinity of Matawailevu, Wainimala River, *St. John 18197*; Naulawai Creek, *DA 9910*; vicinity of Nasinu, *DA 7514*. NAITASIRI-REWA boundary: Mt. Kombalevu, *Parks 20286A*. TAILEVU: Matavatathou, *DA 9938*. REWA: Namboro, *DA 5941*. "VITI LEVU and OVALAU:" U. S. Expl. Exped. (Rewa on Viti Levu); *Seemann 147* (Port Kinnaird on Ovalau). KANDAVU: Hills above Namalata and Ngaloa Bays, *Smith 113*. OVALAU: *Milne 262*. WAKAYA: *Milne 386*. NGAU: *Milne 166, MacGillivray, Sept., 1854*. VANUA LEVU: MBUA: Lower Wainunu River Valley, *Smith 1746*. MATHUATA: Seanggangga region, *DA 12919*; mountains near Lambasa, *Greenwood 621*. MATHUATA-THAKAUNDROVE boundary: Crest of Korotini Range, between

Navitho Pass and Mt. Ndelaikoro, *Smith 554*. THAKAUNDRIVE: Between Nikawa Bay and Valeti, *Bierhorst F59*. MOALA: *Bryan 330*.

4. *ERIOBOTRYA* Lindl. in Trans. Linn. Soc. **13**: 96, 102. 1821.

Small trees, the stipules connate, bifid; leaves alternate, simple, crowded toward apices of branchlets, the blades coriaceous; inflorescences terminal, paniculate; flowers 5-merous, the hypanthium obconical, the calyx lobes small, persistent; disk not completely covering ovary at apex; petals short-clawed; stamens 20-25, uniseriate on upper margin of disk, the filaments subulate, unequal; gynoecium syncarpous, the ovary inferior, (2-)5-locular, the ovules 2 per locule, the styles free; fruit a juicy pome, the mesocarp thin, the seeds 1-5, large, angular.

TYPE SPECIES: Not designated by ING (1979), but Hutchinson (Gen. Fl. Pl. **1**: 214. 1964) so lists *Eriobotrya japonica* (Thunb.) Lindl.

DISTRIBUTION: Tropical and subtropical Asia, with 15-30 species, one of which is widely cultivated and is recorded from Fiji.

1. *Eriobotrya japonica* (Thunb.) Lindl. in Trans. Linn. Soc. **13**: 102. 1821; B. E. V. Parham in Agr. J. Dept. Agr. Fiji **10**: 114. 1939; Yuncker in Bishop Mus. Bull. **220**: 127. 1959; J. W. Parham, Pl. Fiji Isl. ed. 2. 94. 1972.

Mespilus japonica Thunb. Fl. Jap. 206. 1784.

Photinia japonica Benth. & Hook. f. ex Aschers. & Schweinf. Ill. Fl. Egypte, 73. 1887; J. W. Parham in Agr. J. Dept. Agr. Fiji **19**: 101. 1948.

A small, symmetrical tree, with lanceolate or elliptic leaf blades that are tomentose beneath, cultivated near sea level. The fragrant flowers have white petals that soon become discolored and white filaments; the fruit is yellow to brownish, up to 4 cm. long.

TYPIIFICATION: The type was a Japanese plant, presumably collected by Kaempfer.

DISTRIBUTION: A native of China, now widely cultivated. In the Pacific it has been recorded at least from Hawaii, the Mariana Islands, Tonga, and the Cook Islands as well as Fiji.

LOCAL NAME AND USE: *Loquat* is the widely used name. The fruit is sweet and edible, but the species does not grow well at low elevations in the tropics and is not productive in Fiji.

AVAILABLE COLLECTION: VITI LEVU: NANDRONGA & NAVOSA: Agricultural Station, Singatoka, *DA 8301*.

B. E. V. Parham (1939) indicates that the species was introduced in 1920 and was established in 1939 on the property of W. L. Wallace, Tovu Island, Ra Province, Viti Levu. J. W. Parham (1948) noted that the species was growing in the Suva Botanical Gardens, but no voucher has been seen.

FAMILY 122. CHRYSOBALANACEAE

CHRYSOBALANACEAE R. Br. in Tuckey, Narr. Exped. Congo, 433, as *Chrysobalaneae*. 1818.

Trees or shrubs, the stipules minute to large, often persistent; leaves alternate, the petioles often with 2 lateral glands, the blades simple, often coriaceous, pinnate-nerved, entire; inflorescences racemose, paniculate, or cymose; flowers subtended by bracts, usually zygomorphic, infrequently actinomorphic, ♂ (rarely unisexual), the perianth usually dichlamydeous, perigynous, the receptacle often gibbous, lined by a disk; calyx lobes 5, imbricate, often unequal; petals (4 or) 5 (rarely lacking but present in our genera), imbricate, equal or unequal; stamens usually numerous, 7-26 (2-300).

inserted with petals on margin of disk, sometimes unilateral, some of them frequently staminodial, the filaments of fertile stamens filiform, free or connate, the anthers small, 2-locular, longitudinally dehiscent; gynoecium basically composed of 3 carpels (but usually only 1 carpel developing, the others aborted or vestigial), the ovary superior, attached to base, middle, or mouth of receptacle, sessile or rarely with a short gynophore, unilocular and with 2 ovules (or bilocular by a false partition, each locule then with 1 ovule), the ovules erect, with a basal micropyle, the style filiform, gynobasic (attached by its base to receptacular tissue below the ovary), the stigma truncate to 3-lobed; fruit a dry or fleshy drupe, the seeds solitary or sometimes 2, erect, lacking endosperm, the embryo large, the cotyledons plano-convex.

DISTRIBUTION: Pantropical (rarely subtropical), with 17 genera and about 420 species. Three genera occur in Fiji, with four species; two of the genera are indigenous and one species is endemic.

USEFUL TREATMENT OF FAMILY: PRANCE, G. T. *Chrysobalanaceae*. Fl. Neotropica 9: 1-410. 1972.

The *Chrysobalanaceae* are sharply differentiated from the related *Rosaceae* by anatomical and palynological characters as well as by a few obvious floral characters (cf. Prance, 1972, cited above).

KEY TO GENERA

- Flowers actinomorphic, the ovary inserted at base of receptacle, unilocular, the ovules 2; stamens 12-26, inserted in a complete or nearly complete ring, about twice as long as calyx lobes; fruit not more than 5 cm. long (usually 3-4 cm.), with prominent longitudinal ridges when dry (lines of endocarp fracture in germination); introduced and naturalized. 1. *Chrysobalanus*
- Flowers zygomorphic, the ovary inserted laterally near mouth of receptacle, seemingly bilocular at least initially, each locule with 1 ovule; fertile stamens 6-20, unilateral, opposite short, toothlike staminodes; fruit larger, smooth or verrucose, without longitudinal ridges when dry; indigenous.
- Stipules submembranaceous, fugacious; leaf blades reticulate or with stomatal areoles on lower surface, the areoles with gray, arachnoid indument; inflorescences paniculate; fertile stamens (6-) 7 or 8 (-10), the filaments not exceeding calyx lobes; style short, not or only slightly exceeding stamens; fruit usually ellipsoid and laterally flattened, not dehiscent during germination, initially bilocular, sometimes permanently so and with 2 seeds, but usually 1-seeded, the cotyledons not ruminant, the exocarp composed of hyaline, radial spindles, the mesocarp fibrous or fleshy, the endocarp copiously tomentose within. 2. *Parinari*
- Stipules stiff, carinate, subsistent; leaf blades without stomatal areoles, glabrescent and scarious beneath, with rough-margined holes on small nerves; inflorescences spiciform or racemiform; fertile stamens (10-) 12-20, the filaments often exserted and longer than calyx lobes; style equaling or longer than stamens; fruit ellipsoid to subglobose, irregularly cracking during germination, unilocular and 1-seeded at maturity, the cotyledons ruminant, the exocarp thin, fleshy, the mesocarp radially fibrous, the endocarp with short, inconspicuous hairs within. 3. *Atuna*

1. *CHRYSOBALANUS* L. Sp. Pl. 513. 1753; Prance in J. Arnold Arb. 51: 523. 1970, in Fl. Neotropica 9: 14. 1972.

Small trees or shrubs, the stipules small, caducous; leaf blades coriaceous, glabrous or with a few stiff, appressed hairs beneath, with 2 (sometimes obscure) glands at base; inflorescences terminal or axillary, short-cymose or cymose-paniculate, the bracts and bracteoles small, eglandular; flowers actinomorphic, the hypanthium cupuliform, puberulent on both surfaces; calyx lobes acute, pilose; petals 5, slightly longer than calyx lobes; stamens 12-26, exserted, sometimes unequal, inserted in a complete or nearly complete ring, the filaments pilose, proximally connate in small groups, about twice as long as calyx lobes; ovary inserted at base of receptacle, densely pilose, unilocular, the ovules 2, the style pilose; fruit a small, fleshy drupe, the exocarp smooth, ridged in drying, the mesocarp thin and fleshy, the endocarp hard, bony, with 4-10 prominent longitudinal ridges on outer surface (lines of fracture in germination), the seeds 1 or 2.

TYPE SPECIES: *Chrysobalanus icaco* L., the only original species.

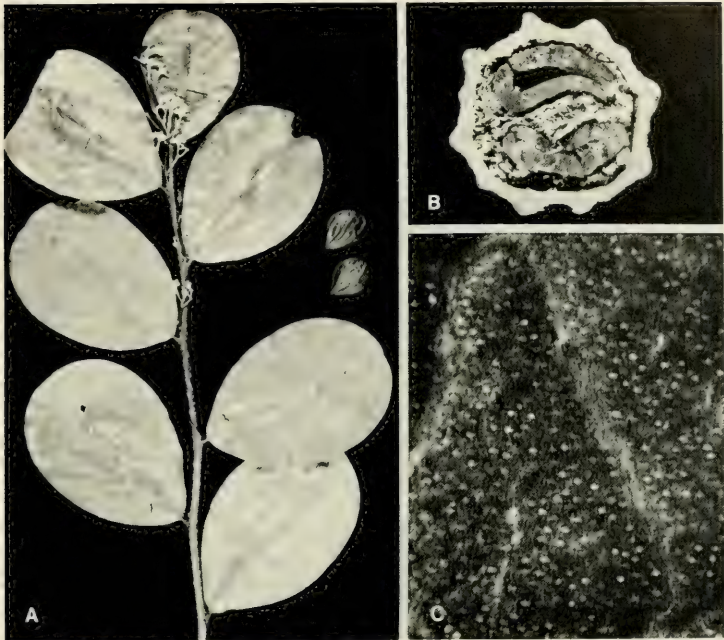


FIGURE 9. *Chrysobalanus icaco*: A, distal portion of branchlet, with foliage and inflorescences, and detached fruits, $\times 1/3$; B, cross section of dried fruit, showing external ridges and plano-convex cotyledons, $\times 2$; C, detail of lower surface of leaf blade, showing copious glands, $\times 40$. A from Meebold 21388, B from DA 10091, C from Smith 9611.

DISTRIBUTION: Tropical America and western Africa, with three or four species, one of which is sparingly cultivated and locally naturalized in Fiji.

1. *Chrysobalanus icaco* L. Sp. Pl. 513. 1753; A. C. Sm. in Sargentia 1: 36. 1942; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 101. 1948; Greenwood in J. Arnold Arb. 30: 76. 1949; J. W. Parham in Dept. Agr. Fiji Bull. 35: 80. fig. 37. 1959, Pl. Fiji Isl. 61. 1964, ed. 2. 94. 1972; Prance in J. Arnold Arb. 51: 525. fig. 1, a-j. 1970, in Fl. Neotropica 9: 15. fig. 2. 1972.

FIGURE 9.

As seen in Fiji, *Chrysobalanus icaco* is a shrub or tree 2-8 m. high, infrequently cultivated but often locally abundantly naturalized along roadsides near sea level, on the upper edge of beaches, and in thickets on the inner margin of mangrove swamps. The petals, filaments, and style are white, the anthers pale yellow. The ovoid to obovoid fruits turn from green to reddish at maturity and are 3.5-4 (-5) \times 2-3 cm., becoming longitudinally ridged when dry.

TYPIFICATION: Prance (1972, p. 16) indicated the holotype as *Patrick Browne* (LINN 641), from Jamaica; in view of Linnaeus's many references, this specimen might better be considered the lectotype.

DISTRIBUTION: Mexico and Florida through the West Indies and along the northern and eastern coasts of South America to southern Brazil; also in coastal regions of western Africa from Guinea to Angola; sparingly cultivated and naturalized elsewhere. In the Pacific it is known to be cultivated in Hawaii and the Societies. It was probably introduced into Fiji during the 1920's or 1930's, the earliest collection known to me being *H. B. R. Parham 20*; it was growing in the Suva Botanical Gardens in 1948 and had been abundantly naturalized in southeastern Viti Levu prior to that date.

LOCAL NAME AND USES: No Fijian name has been recorded for the species locally known as *coco plum*. Presumably the plant was introduced as an ornamental, and the white, soft, sweetish but scanty pulp (mesocarp) of its fruits is edible.

AVAILABLE COLLECTIONS: VITI LEVU: SERUA: Flat coastal strip in vicinity of Ngaloa, *Smith 9611*; Ndeumba Beach, *DA 11458*; Waimate Beach, *DA 10100*; Karombo Beach, *DA 16493*; Naitonitoni Beach, *Greenwood 1027*. NAITASIRE: Vicinity of Nasinu, *Greenwood 1027A*, *DA 7503*, *10090*, *10091*. REWA: Along Queen's Road, *Meebold 21388*, *DA 1286*; near Suva, *H. B. R. Parham 20*. FIJI without further locality, *DA 3994*.

In America and Africa *Chrysobalanus icaco* demonstrates considerable variation in leaf size and shape; the Fijian specimens have leaf blades fairly constantly elliptic-ovate, 7-11 × 4.5-7 cm., and rounded to retuse at apex.

2. *Parinari* Aubl. Hist. Pl. Guiane Fr. 514. 1775; Kostermans in Reinwardtia 7: 151. 1965; Prance in Fl. Neotropica 9: 178. 1972.

Parinarium Juss. Gen. Pl. 342, orth. mut. 1789; Seem. Fl. Vit. 75, p. p. 1865.

Trees or shrubs, the stipules lateral to petiole or axillary, thin, usually soon caducous; leaves with usually biglandular petioles, the blades chartaceous to coriaceous, reticulate or with stomatal areoles on lower surface, the areoles with arachnoid indument; inflorescences axillary or terminal, paniculate, freely branched, with conspicuous (but caducous) bracts; flowers zygomorphic, the hypanthium turbinate to campanulate, gibbous near throat at attachment of ovary, densely pilose without, retrorsely strigose below ovary within; calyx lobes pilose on both sides, acute; petals 5, small, spatulate, thin, glabrous, soon caducous; stamens inserted on margin of disk, the fertile ones (6-) 7 or 8 (-10), unilateral, those opposite the style staminodial and represented by short teeth, the filaments glabrous, not exceeding calyx lobes; ovary lateral near mouth of receptacle, adnate to hypanthium, densely pilose, seemingly bilocular, each locule with 1 ovule, the style short, not or only slightly exceeding stamens, glabrous or proximally pilose; fruit a fleshy drupe, ellipsoid to subglobose, usually laterally compressed, initially 2-locular but usually with a single developing seed, not dehiscent during germination, the exocarp verrucose, lenticellate, composed of hyaline, radial spindles, the mesocarp coarsely fibrous or fleshy, the endocarp hard, bony, with 2 basal plugs the detachment of which allows the seedling to escape, copiously tomentose within, the cotyledons not ruminant.

LECTOTYPE SPECIES: *Parinari campestris* Aubl. (vide Hauman in Bull. Jard. Bot. Étât 21: 190. 1951; Prance in Fl. Neotropica 9: 178, 182. 1972).

DISTRIBUTION: Pantropical, with about 50 species. One species is indigenous in Fiji.

USEFUL TREATMENT OF GENUS: KOSTERMANS, A. J. G. H. A monograph of the genus *Parinari* Aubl. (Rosaceae-Chrysobalanoideae) in Asia and the Pacific region. Reinwardtia 7: 147-213. 1965.

1. *Parinari insularum* A. Gray, Bot. U. S. Expl. Exped. 1: 488, as *Parinarium i.* 1854, Atlas, pl. 54, B, as *Parinarium i.* 1856; J. W. Parham, Pl. Fiji Isl. 61. 1964, ed. 2. 94. 1972; Kostermans in Reinwardtia 7: 181. fig. 18. 1965; St. John & A. C. Sm. in Pacific Sci. 25: 327. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 109. 1972.

FIGURES 10, 11A-C, 89.

Parinari insularum A. Gray ex Seem. Fl. Vit. 75, 1865; Drake, Ill. Fl. Ins. Mar. Pac. 161, 1890; Christophersen in Bishop Mus. Bull. 128: 97, 1935; Yuncker in op. cit. 184: 40, 1945, in op. cit. 220: 127, 1959.

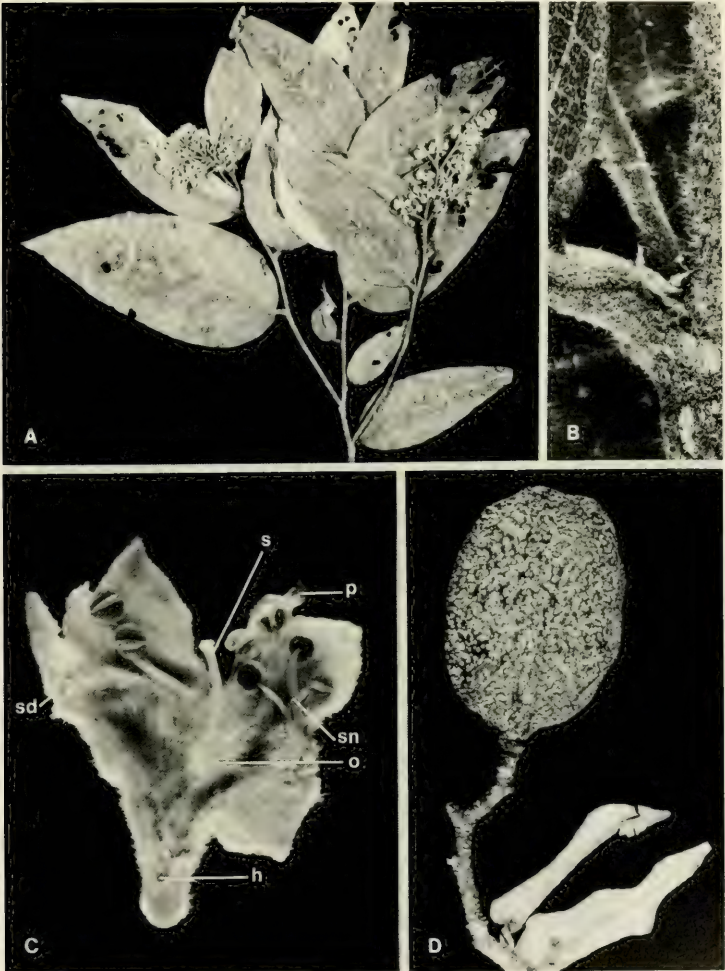


FIGURE 10. *Parinari insularum*: A, distal portion of branchlet, with foliage and inflorescences, $\times 1/3$; B, leaf axil with petiole, base of inflorescence peduncle, and stipule, $\times 6$; C, section of flower, with 2 calyx lobes and 3 petals removed, showing base of hypanthium (h), ovary (o), style (s), petal (p), stamens (sn), and staminodes (sd), $\times 10$; D, mature fruit, $\times 1$. A-C from Smith 6655, D from Smith 6431.

A tree 8-30 m. high, with a trunk up to 50 cm. or more in diameter, occurring from near sea level to an elevation of about 800 m. and often locally abundant in dense or open forest, ridge forest, and sometimes in coastal thickets. The brown bracts subtend flowers that have the calyx lobes greenish with a brown indument, and the petals are

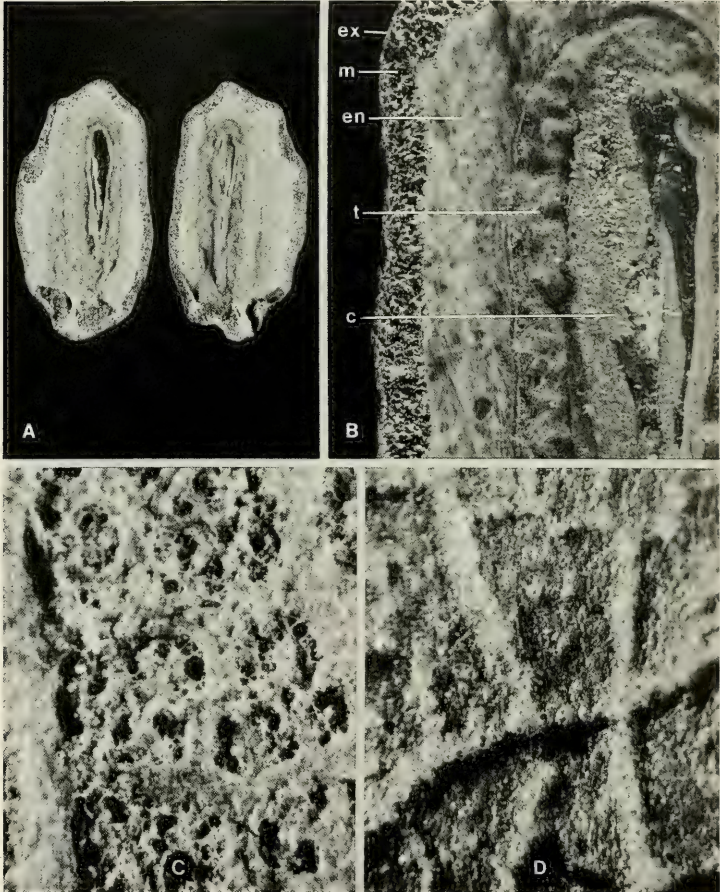


FIGURE 11. A-C, *Parinari insularum*; A, longitudinal section of mature fruit, showing developing seed, a second (vestigial) locule, and basal plugs in endocarp, $\times 1$; B, longitudinal section of fruit wall, showing exocarp (ex), mesocarp (m), endocarp (en), copious tomentum (t) of endocarp, and cotyledon (c), $\times 6$; C, detail of lower surface of leaf blade, showing arachnoid indument of areoles, $\times 40$. D, *Atuna racemosa*, detail of lower surface of leaf blade, showing minute, rough-margined holes on nerves, $\times 40$. A & B from Gillespie 3619, C from Smith 9128, D from DA 9814.

white, turning brownish; the fertile stamens are often 8, the sterile ones being toothlike. The fruits are dull green to olivaceous, with copious brown lenticels. Flowers have been obtained between March and October, while fruits persist for much of the year.

LECTOTYPIFICATION: Gray originally cited the Exploring Expedition material as being from Sandalwood (Mbua) Bay on Vanua Levu, Mbau, and Samoa. The only specimen identified by Gray remaining at US, with good flowers and fruits, is *U. S. Expl. Exped.* (US 75124 herewith designated as LECTOTYPE), collected in Samoa without further locality, probably in 1839. The K sheet bears two fragments noted as from Fiji and Samoa; probably neither this nor any other Exploring Expedition specimen should be considered a definite isolectotype.

DISTRIBUTION: Fiji, Tonga, Samoa, and the Wallis Islands; about 65 Fijian collections from five of the high islands have been examined, but the species doubtless occurs on other islands.

LOCAL NAMES AND USES: The well-established Fijian name is *sea*; also recorded are *sa* and *sere*. The species produces a useful hardwood, frequently used for house posts; the bark, together with that of *Pometia pinnata* (Sapindaceae), is used in the Namosi area as a diuretic; and one collector notes the fruit as edible, which seems unlikely.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBUA: Vicinity of Nandarivatu, *Mead 1992, Gillespie 3885*. NANDRONGA & NAVOSA: Nausori Highlands, *DF 659 (S1409/5)*. SERUA: Nambukelevu, upper Navua River, *Berry 111*; inland from Navutulevu, *DF 658 (S1409/4, Bola NL-2)*; hills east of Navua River, near Nukusere, *Smith 9128*. NAMOSI: Northern slopes of Korombasambasanga Range, in drainage of Wainavindrau Creek, *Smith 8752*; Nambukavesi Creek, *Bola NI-8 (S1409/2)*. NAITASIRE: Viti-Naisonggo trail, *Parks 20436*; vicinity of Tamavua, *Yeoward 102*; vicinity of Nasinu, *Gillespie 3619*. TAILEVU: Nanggelendamu, *DA 4031*; near Namalata, *DA 2674*. REWA: Vicinity of Lami, *Meebold 17045*. VITI LEVU without further locality, *Seemann 146*. KANDAVU: Hills above Namalata and Ngaloa Bays, *Smith 196*; vicinity of Naikorokoro, *DF 660 (S1409/6, Bola KU-4)*. OVALAU: Hills east of Lovoni Valley, *Smith 7316*. VANUA LEVU: MATHUATA: Above Nasingasinga, *Berry 50*; Seangangga Plateau, in drainage of Korovuli River, vicinity of Natua, *Smith 6655*; southern slopes of Mt. Numbuloa, east of Lambasa, *Smith 6431*. THAKAUNDOVE: Mt. Kasi, Yanawai River region, *Smith 1824*; between Mbalanga and Valethi, Savusavu Bay, *Degener & Ordenez 14049*. TAVEUNI: Vicinity of Wairiki, *Gillespie 4639*.

3. *ATUNA* Raf. *Silva Tellur.* 153. 1838; *Kostermans in Reinwardtia* 7: 421. 1969.

Cyclandrophora Hassk. in *Flora* 25 (2), Beibl. 1: 47. 1842; *Kostermans in Candollea* 20: 118. 1965. *Parinarium* sensu Seem. *Fl. Vit.* 75, p. 1865, et auct.; non Juss.

Trees, the stipules narrow, stiff, erect, carinate, lateral to petiole and enveloping bud, subsistent; leaves with eglandular petioles, the blades chartaceous to coriaceous, without stomatal areoles beneath but with reticulation marked by rough-margined holes; inflorescences subterminal and axillary, spiciform or racemiform, with conspicuous bracts before anthesis; flowers zygomorphic, the hypanthium obconical, slightly gibbous near throat at attachment of ovary, pilose without, densely and retrorsely strigose below ovary within; petals 5, longer than calyx lobes, glabrous, membranaceous, gradually narrowed proximally, soon caducous; stamens inserted on margin of disk, the fertile ones (10-) 12-20, unilateral, those opposite the style staminodial and represented by short teeth, the filaments often exerted and longer than calyx lobes; ovary laterally attached to mouth of receptacle, adnate to hypanthium, densely appressed-pilose, initially seemingly bilocular, each locule with 1 ovule, the style slender, as long as or longer than stamens; fruit ellipsoid to subglobose, often laterally compressed, unilocular, with a single developing seed, irregularly cracking during germination, the exocarp thin, fleshy, the mesocarp radially fibrous, the endocarp thin, bony, with short, inconspicuous hairs within, the cotyledons ruminate.

TYPE SPECIES: The type species of *Atuna* is *A. racemosa* Raf.; that of *Cyclandrophora* is *C. glaberrima* Hassk. (= *Atuna excelsa* (Jack) Kostermans).

DISTRIBUTION: Indo-Malesia and eastward in the Pacific to Tonga and Samoa. In Fiji two species are indigenous, one of them being endemic.

USEFUL TREATMENTS OF GENUS: KOSTERMANS, A. J. G. H. A monograph of the genera *Maranthes* Bl. and *Cyclandrophora* Hassk. (Chrysobalanaceae) of the Asiatic and Pacific area. *Candollea* 20: 103-158. 1965. KOSTERMANS, A. J. G. H. *Atuna* Rafin. versus *Cyclandrophora* Hassk. (Rosaceae-Chrysobalanoideae). *Reinwardtia* 7: 421-422. 1969.

The genus *Parinari* had been very broadly construed prior to recent studies by Kostermans and Prance. *Cyclandrophora* was the name utilized by Kostermans (1965, cited above) for one of the segregates, *Atuna* Raf. having been considered a later homonym of *Atunus* Lam., a synonym of *Heritiera* (Sterculiaceae). However, *Atuna* and *Atunus* are not homonyms (ICBN, Art. 75.1), and the first was properly used for the chrysobalanaceous genus by Kostermans in 1969.

KEY TO SPECIES

- Stipules up to 20 mm. long; leaf blades ovate to elliptic or lanceolate, 10-35 × (2.5-) 5-13 cm., acute to subcordate at base, gradually acuminate at apex, the secondary nerves (6-) 10-15 per side; inflorescences often to 15 cm. long, the pedicels 1 mm. long or less; hypanthium 5-10 mm. long, the filaments 10-15 mm. long. 1. *A. racemosa*
 Stipules 9-17 mm. long; leaf blades elliptic, 5-16 × 4-10 cm., rounded to obtuse at base, rounded at apex, the secondary nerves 5-8 per side; inflorescences 2-7 cm. long, the pedicels 1-5 mm. long; hypanthium 4-5 mm. long, the filaments 4-9 mm. long. 2. *A. elliptica*

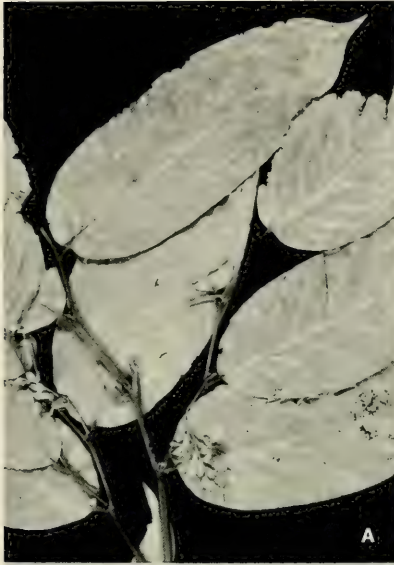
1. *Atuna racemosa* Raf. *Sylva Tellur.* 153. 1838; Kostermans in *Reinwardtia* 7: 422. 1969. FIGURES 11D, 12, 13A, 88 (lower).

- Parinari laurinum* A. Gray, *Bot. U. S. Expl. Exped.* 1: 490. 1854, *Atlas, pl. 55.* 1856; Seem. in *Bonplandia* 9: 255. 1861, *Viti*, 436. 1862, *Fl. Vit.* 75. 1865; Drake, *Ill. Fl. Ins. Mar. Pac.* 161. 1890.
Parinari margarata A. Gray, *Bot. U. S. Expl. Exped.* 1: 489. 1854, *Atlas, pl. 54, A.* 1856.
Parinari glaberrimum sensu Christophersen in *Bishop Mus. Bull.* 128: 97. 1935; Yuncker in op. cit. 184: 40. 1945, in op. cit. 220: 127. 1959; non Hassk.
Parinari glaberrima sensu J. W. Parham, *Pl. Fiji Isl.* vi. 1964, ed. 2. 94. 1972; St. John & A. C. Sm. in *Pacific Sci.* 25: 327. 1971; B. E. V. Parham in *New Zealand Dept. Sci. Indust. Res. Inform. Ser.* 85: 43. 1972; non *Parinari glaberrimum* Hassk.
Parinari laurina A. Gray ex J. W. Parham, *Pl. Fiji Isl.* 61. 1964.
Parinari margarata A. Gray ex J. W. Parham, *Pl. Fiji Isl.* 61. 1964.
Cyclandrophora laurina Kostermans in *Candollea* 20: 135. 1965, in *Reinwardtia* 7: 185. 1965.

As it is seen in Fiji, *Atuna racemosa* is a tree 5-20 m. high, occurring from near sea level to an elevation of about 500 m. in forest or in grassland thickets. The petals are white, sometimes tinged with purple toward base; the filaments are white to pale blue; and the brown fruits are subglobose or laterally flattened, up to 8 (-10) cm. in diameter. Flowers and fruits have been noted throughout the year.

TIPIFICATION AND NOMENCLATURE: *Atuna racemosa* was based by Rafinesque on *Atun* Rumph. *Herb. Amb.* 1: t. 66. 1741 (cf. Merr. *Interpret. Rumph. Herb. Amb.* 247. 1917, *Index Rafin.* 136. 1949). The type of *Parinari laurinum* is *U. S. Expl. Exped.* (US 65333 HOLOTYPE; ISOTYPE at K), collected in Samoa without further locality, presumably in 1839; that of *P. margarata* is *U. S. Expl. Exped.* (US 62799 HOLOTYPE; fragmentary ISOTYPE at K), obtained in the "Sandalwood district" (presumably inland from Mbua Bay), Mbua Province, Vanua Levu, in 1840. This well-known species has usually passed as *Parinari glaberrimum* (Hassk.) Hassk., but that species (based on *Cyclandrophora glaberrima* Hassk.) has no extant type and apparently was described from a living Javanese plant; it is referable to *Atuna excelsa* (Jack) Kostermans. The discussions of Kostermans (in *Candollea* 20: 128-142. 1965, in *Reinwardtia* 7: 422. 1969) have listed and clarified a complicated synonymy. *Atuna racemosa* does not

FIGURE 12. *Atuna racemosa*; A, distal portion of branchlet, with foliage and inflorescences, × 1/3; B, stipules, with petiole and base of leaf blade, × 6; C, mature fruit, showing irregular cracks prior to germination of seed, × 1; D, flower, the petals and most anthers fallen, showing detached petal, style(s), and staminodes (sd), × 4. A, B, & D from *DA 9814*, C from *Smith 1713*.



A



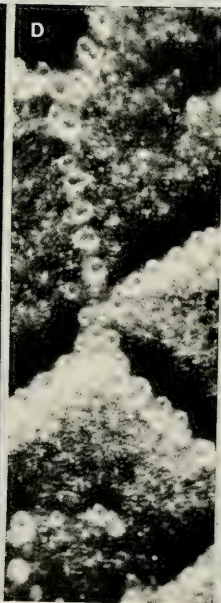
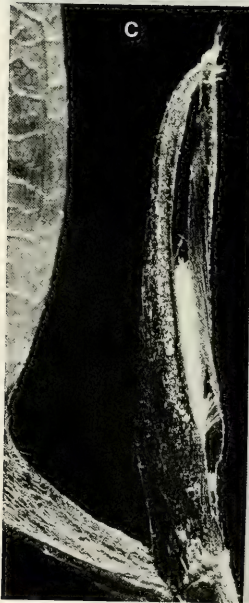
B



C



D



occur wild in Java, and the two species have overlapping ranges only in Borneo, according to Kostermans's interpretations. Only synonyms noted in the literature referring to the Fijian Region have been listed above.

DISTRIBUTION: Malesia (Philippines, Borneo, and Amboina) eastward to the Caroline Islands, Tonga, and Samoa. I have examined about 45 collections from three of the high Fijian islands.

LOCAL NAMES AND USES: *Makita* and *makita ndamu* are the widely used Fijian names; *sa* has been infrequently recorded, suggesting confusion of this species with *Parinari insularum*. The name *margarata* was noted by Pickering, according to Gray; this does not suggest a Fijian word and must be questioned. The timber has been used for posts, poles, and canoe spars, and leafy branchlets are still widely utilized to thatch the outside walls of houses, as the leaves remain attached to twigs indefinitely. The seeds are crushed to make a fragrant juice which is used to scent coconut oil, and the inner bark is reputed to be used medicinally as part of an internal remedy for high blood pressure.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mountains inland from Lautoka, *Greenwood 427*; vicinity of Tumbenasolo, valley of Namosi Creek, *Smith 4723*. NANDRONGA & NAVOSA: Near Nakalavo Village, *H. B. R. Parham 251*; vicinity of Saru, Tamanua Creek, inland from Vatukarasa, *W. L. Parham*, May 17, 1931, p. p. (K). SERUA: Vicinity of Ngaloa, *DF 919*. NAMOSI: Near Namosi, *Gillespie 2569*. RA: Ndombuilevu, *DA*, Dec. 7, 1948. NAITASIRE: Vicinity of Matawailevu, Wainimala River, *St. John 18221*; Plant Introduction and Quarantine Station, Nanduruloulou, *DA 9814*; Prince's Road, *Vaughan 3459*. TAILEVU: Raralevu Village, *Weiner 128*. REWA: Namboro, *DF 265*; Rewa River delta, *MacDaniels 1019*. KANDAVU: *DA 11942*; Kiombo Creek, Naikorokoro, *Damanu D-1*. VANUA LEVU: MBUA: Southern portion of Seatovo Range, *Smith 1713*. MATHUATA: Seangangga Plateau, in drainage of Korovuli River, vicinity of Natua, *Smith 6680*. THAKAUNDOVE: Eastern drainage of Yanawai River, *Degener & Ordenez 14100*; Tukavesi, Mbutha Bay, Natewa Peninsula, *Mead 1994*. FIJI without further locality, *Seemann 146*.

2. *Atuna elliptica* (Kostermans) Kostermans in Reinwardtia 7: 421. 1969.

FIGURE 13B-E.

Parinari elliptica Kostermans in Reinwardtia 7: 48. fig. 2. 1965; J. W. Parham, Pl. Fiji Isl. ed. 2. 94. 1972. *Cyclandrophora elliptica* Kostermans & Prance in Reinwardtia 7: 120. 1965.

A small tree 7-10 m. high, infrequent from near sea level to an elevation of about 100 m., found in open forest and usually near streams. The petals are white with pinkish margins, the filaments are yellow, and the anthers are mauve. No fruits are now available, but they are indicated to be large and ovoid to globose. On the basis of available field notes, flowers have been collected in January, April, and May, and fruits were observed in April and May.

TYPIFICATION: Kostermans cited as the type *Parham s. n.* (K HOLOTYPE), collected in flower in January (year?), alt. 70 m., in a sheltered valley at Vunindawa, Naitasiri Province, Viti Levu. This specimen has not been located at K, nor does the published photograph permit one to read the field label that presumably indicates the collector's initials. It was probably obtained by B. E. V. Parham prior to or in 1936, the year in which he began to assign numbers to the "DA" series; he often collected in the vicinity of Vunindawa. Perhaps the holotype and the paratype *Peni Turaga s. n.* (K) (indicated to be a sterile specimen from Naitasiri) are still on loan. A second paratype, *Horne 242*,

FIGURE 13. A, *Atuna racemosa*; longitudinal section of a submature fruit, with a shrivelled seed and trace of an incomplete partition, $\times 1$. B-E, *Atuna elliptica*; B, distal portion of branchlet, with foliage and an inflorescence, $\times 1/3$; C, stipules, with petiole and margin of leaf blade, $\times 6$; D, detail of lower surface of leaf blade, showing minute, patelliform holes on nerves, $\times 70$; E, distal portion of old inflorescence with developing ovary, the petals, anthers, and most filaments fallen, bracts and a few sepals remaining, $\times 4$. A from *Smith 1713*, B-E from *DA 476*.

remains at κ ; this had been annotated as the holotype by Kostermans, but apparently he changed his mind before publishing the name *Parinari elliptica*.

DISTRIBUTION: Endemic to Fiji and apparently rare, known only from Viti Levu.

LOCAL NAME AND USES: *Makita leka* (*leka* = short, referring to the very obvious difference in leaf blade length and apex that readily distinguishes this species from the true *makita*, *Atuna racemosa*). Uses similar to those of *A. racemosa* have been indicated; the timber is locally used as poles, the leafy branches as thatch, and the seeds to scent coconut oil.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Vicinity of Saru, Tamanua Creek, inland from Vatukarasa, *W. L. Parham*, May 17, 1931, p. p. (κ). NAITASIRI: Vicinity of Viria, *DA 110* (coll. *B. E. V. Parham*, April 27, 1936) (SUVA), 476 (coll. *B. E. V. Parham*, May 13, 1936) (SUVA); Naitasiri without further locality, *Turaga s. n.* (κ , not seen but cited by Kostermans). FIJI without further locality, *Horne 242* (κ). (From the low number, one may assume that Horne obtained his specimen in the Rewa River area, which he visited early during his Fijian trip, cf. Horne, *A Year in Fiji*, 5, 6, 1881.)

ORDER FABALES

Whether to consider the legumes (Fabales or Leguminales) as constituting a single family (Fabaceae or Leguminosae) or as divisible into three families remains a matter of opinion. Much current opinion seems to favor the recognition of one family with three well-marked subfamilies (Polhill and Raven (eds.), *Adv. Leg. Syst.*, 1981). If three families are accepted, their compositions in most cases are clear and unambiguous, although there are a few genera that seem transitional among the three groups. In view of the vacillation demonstrated by several well-known phylogenists in recent years, and because the three groups within the order seem as well characterized and discrete as most families currently accepted, the groups are here treated as families. It now seems generally agreed (Polhill and Raven in *Adv. Leg. Syst.* 1–26, 1981) that the most archaic genera of legumes fall into the Caesalpinaceae (or subfamily Caesalpinioideae), from different groups of which the Mimosaceae (or subfamily Mimosoideae) and Fabaceae (or subfamily Papilionoideae or Faboideae) were evolved.

The order Fabales is economically one of the most valuable groups of plants. The seeds and/or pods of many species are important as food: beans, peas, lentils, peanuts, etc. Many genera include valuable fodder plants and cover crops, while others are well known for their timber trees, and still others produce fibers, dyes, gums, resins, and oil. Ornamental plants abound in the order. If taken as a single family, the legume family (then to be called Fabaceae or Leguminosae) is the third largest among flowering plant families, with more than 650 genera and about 18,000 species, exceeded only by Asteraceae (Compositae) and Orchidaceae.

In spite of the worldwide size of the group, it is not a particularly conspicuous component of the indigenous Pacific flora—at least in comparison with its abundance in many continental areas. Taking the group as a whole, 96 genera of legumes are here recorded as being in Fiji, but only 31 of these genera are represented by indigenous species. Some of these 31 genera also have cultivated and/or adventive species in Fiji. Sixty-five of the genera here treated are represented in Fiji only by cultivated (and often naturalized) or adventive species.

It must be noted that the Fabales cannot summarily be included in or allied to the order Rosales. In most classification systems the legumes have been placed as having their closest affinity with the Connaraceae, a viewpoint summarized by Dickison (in *Adv. Leg. Syst.* 35–54, 1981). However, a closer relationship between the legumes and

the sapindaceous alliance is now suggested by evidence from wood anatomy (Baretta-Kuipers in *Adv. Leg. Syst.* 677-705. 1981), phytochemical data, trichome morphology, embryology, etc., as noted by Dickison and other contributors to *Advances in Legume Systematics*. Further discussion of such complex relationships are out of place in a regional Flora such as the present work.

USEFUL TREATMENTS OF ORDER (or inclusive family comprising three subfamilies): SCHULZE-MENZ, G. K. *Fam. Leguminosae. In: Melchior, H. Engl. Syll. Pflanzenfam.* ed. 12. 2: 221-240. 1964. VERDCOURT, B. A. *Manual of New Guinea Legumes* (Papua New Guinea Dept. Forests Bull. 11), 1-645. 1979. POLHILL, R. M., & P. H. RAVEN (eds.). *Advances in Legume Systematics*, 1-1049. 1981.

Of the above-cited treatments, that of Verdcourt on New Guinea legumes is important for our purposes in that it includes most of the genera and many of the species known to occur in Fiji. *Advances in Legume Systematics* is a milestone of sorts, concentrating the expertise of a large group of specialists to produce an improved classification based on many modern criteria in addition to the traditional morphological ones. The resulting synopsis of tribes and genera has been freely abstracted for present purposes; it builds upon the basic nineteenth century work of Benth and supplements that of Hutchinson (1964, cited below under each of the three families). Additional valuable treatments of the component parts of Leguminosae (sensu lato), cited below, include those of the *Flora of Tropical East Africa* and precursor papers. These are important to a summary of the legumes of any tropical area in that they discuss taxa now cultivated or naturalized throughout the tropics.

In the present work the sequence of genera in each family (subfamily) follows that proposed by the contributors to *Advances in Legume Systematics*, and the keys to tribes and genera in that work have been adapted to such taxa known to occur in Fiji.

KEY TO FAMILIES

- Flowers actinomorphic, the petals valvate in bud, often united at base; sepals usually united at base; stamens as many as petals or twice as many or numerous, free or united into a tube or to base of petals; seeds normally with an areole (pleurogram) on each side or face; leaves bipinnate, or less often pinnate, or phyllodic. 123. MIMOSACEAE
- Flowers nearly always zygomorphic, the petals imbricate in bud, free or some of them united; stamens 10 or fewer or occasionally more numerous; seeds usually without areoles (pleurograms).
- Adaxial petal overlapped by adjacent lateral petals (if these are present); sepals generally free to hypanthium rim or to pedicel; stamens 10 or fewer or occasionally more numerous, free or less often variously united; seeds without a hilar groove and generally with a straight radicle; leaves bipinnate or pinnate, rarely simple or unifoliolate. 124. CAESALPINIACEAE
- Adaxial petal overlapping adjacent lateral petals (at least in all taxa occurring in Fiji); sepals united at base; stamens 10, rarely fewer, never more numerous, free or the adaxial (upper) one free and the other 9 united (diadelphous), or united in 2 groups (diadelphous) or all united (monadelphous); seeds with the radicle usually curved; leaves never bipinnate. 125. FABACEAE

FAMILY 123. MIMOSACEAE

MIMOSACEAE R. Br. in *Flinders, Voy. Terra Australis* 2: 551, as *Mimoseae*. 1814.

Trees, shrubs, lianas, or rarely herbs, often prickly or spiny, stipulate, the stipules sometimes spine-like; leaves alternate, bipinnate, rarely simply pinnate, sometimes phyllodic; inflorescences spicate or capitate, rarely racemose or umbelliform, the bracts small, often deciduous; flowers actinomorphic, ♂ or unisexual, sometimes neuter and sterile; perianth dichlamydeous, hypogynous or slightly perigynous; calyx usually with 5 lobes, these valvate, rarely imbricate, rarely free; petals as many as calyx lobes, valvate in bud, free or united at base into a corolla; disk usually absent; stamens numerous or twice as many as petals or few (as many as petals), free or monadelphous or adnate to base of petals, the anthers small, versatile, 2-locular, often gland-tipped at apex, dehiscing lengthwise, the pollen grains sometimes simple but frequently com-

pound or united; ovary free, unilocular, the ovules usually numerous, the style usually filiform, the stigma small, terminal; fruit dehiscent or indehiscent, sometimes breaking into 1-seeded segments, the seeds usually ovate or orbicular, compressed, sometimes winged, usually with lateral pleurograms (areoles), the hilum basal, an aril rarely present, the testa hard, the endosperm none or very thin, the cotyledons flat, the radicle straight, not folded.

DISTRIBUTION: Pantropical and subtropical, especially numerous in the Southern Hemisphere, with about 62 genera and 3,000 species. In Fiji 14 genera have been recorded, five of them with indigenous species.

USEFUL TREATMENTS OF FAMILY: BRENNAN, J. P. M. Leguminosae Subfamily Mimosoideae, 1-173. 1959. *In:* Hubbard, C. E., & E. Milne-Redhead (eds.). *Fl. Trop. E. Afr. HUTCHINSON, J. Mimosaceae. Gen. Fl. Pl. 1: 277-297. 1964. KOSTERMANS, A. J. G. H. Mimosaceae. In: Dassanayake, M. D., & F. R. Fosberg (eds.). Rev. Handb. Fl. Ceylon 1: 459-508. 1980.*

KEY TO TRIBES OCCURRING IN FIJI

- Calyx lobes imbricate in bud; unarmed trees with bipinnate leaves; our genus with inflorescences of globose, biglobose, or clavate heads and with heteromorphic flowers, the proximal ones ♂ or sterile, the stamens 10. 1. PARKIEAE
- Calyx lobes valvate in bud.
- Stamens 10 or fewer (as many as or twice as many as petals), the filaments free or connate only at base; leaves bipinnate (rarely phyllodic but not in any of our species). 2. MIMOSEAE
- Stamens more than 10 (in our genera seldom fewer than 20).
- Filaments free or connate only at base; leaves bipinnate or reduced to phyllodes (as in all our indigenous species). 3. ACACIEAE
- Filaments proximally connate into a tube; leaves bipinnate (rarely pinnate but not in any of our genera). 4. INGEAE

KEYS TO GENERA

TRIBE 1. PARKIEAE

One genus only in Fiji, represented by a rare, indigenous species. 1. *Parkia*

TRIBE 2. MIMOSEAE

Neuter or nonfunctional ♂ flowers (sometimes caducous) present at base of inflorescence; inflorescences capitate or short-spicate; petals free or slightly coherent at base; filaments free; fruits linear, dehiscent and 2-valved, the seeds longitudinal or oblique; leaflets opposite; our species a sparingly naturalized woody herb or low shrub. 8. *Desmanthus*

Neuter flowers absent (except in a few species of *Mimosa*).

Plants with stipular or scattered spines or spine-tipped branches; foliage glands usually present, the leaflets opposite or subopposite; inflorescences spicate or spiciform-racemose, rarely capitate; petals free or proximally connate; stamens free; fruits indehiscent, not segmented; our species introduced and perhaps sparingly naturalized. 4. *Prosopis*

Plants unarmed (sometimes with recurved prickles or stipular thorns but then foliage glands absent).

Flowers in heads, with persistent, spatulate bracts, the peduncle with an involucrel; fruits dehiscing down both sutures or opening only along margins; leaflets opposite.

Anthers eglandular; fruits 2-valved, the valves separating, not winged; our species an abundantly naturalized shrub or small tree. 6. *Leucaena*

Anthers with small, stalked, apical glands; fruits indehiscent, the valves narrowly winged, splitting at edges but not separating over seed chambers; our species an indigenous tree or shrub. 7. *Schleinitzia*

Flowers in spikes (or if in heads as in some species of *Mimosa* then the fruits not as in *Leucaena* or *Schleinitzia*).

Style tapering to a small, porate stigma; pollen in compound grains.

Flowers with distinct, jointed pedicels; leaflets clearly alternate; calyx campanulate, shortly 5-dentate; anthers with a stalked, fugacious, apical gland; fruits dehiscent with 2 thin valves, these spirally twisted after dehiscence but not breaking up, the seeds brightly colored, subsersistently attached to valves; our species a naturalized, unarmed tree. 2. *Adenanthera*

Flowers sessile; leaflets opposite or subopposite; calyx usually minute, irregularly or minutely dentate, sometimes pappuslike; anthers eglandular; fruits 2-valved, the valves separating from sutures to form 1-seeded segments and leaving a persistent replum, rarely remaining entire; our species naturalized, thorny, weedy scrambling shrubs or coarse herbs. 5. *Mimosa*

Style tip tubular; pollen in simple grains; fruits large, the sutures thickened, continuous in a persistent replum, the valves splitting transversely into 1-seeded segments; our species an indigenous liana, the leaves with 1 or 2 pairs of pinnae each with 1-3 pairs of large leaflets, the rachis terminating in a bifid tendril. 3. *Entada*

TRIBE 3. ACACIEAE

One genus only in Fiji; our species indigenous (and then with phyllodic leaves) or introduced (and then with bipinnate or phyllodic leaves). 9. *Acacia*

TRIBE 4. INGEAE

At least the terminal pairs of leaflets opposite; our species cultivated and sometimes naturalized.

Fruits thick-margined, 2-valved, the valves elastically dehiscent from apex, not segmented; seeds uniseri- ally arranged, without an aril, with a hard testa with pleurogram. 12. *Calliandra*

Fruits with valves not elastically dehiscent.

Seeds without an aril; flowers usually heteromorphic; armed or unarmed trees or shrubs, the stipules usually inconspicuous and caducous.

Fruits straight or slightly curved, flattened, dehiscent or not, segmented or not; seeds uniseri- ally arranged; flowers of the same part-inflorescence usually heteromorphic; our species cultivated and sometimes naturalized. 10. *Albizia*

Fruits twisted in a flat plane into a circle or curved-reniform, thick and compressed, indehiscent, at length woody, the endocarp forming septa between seeds; seeds biserially arranged; flowers of the same part-inflorescence uniform; our species a cultivated, large, spreading tree with a massive trunk. 11. *Enterolobium*

Seeds arillate; fruits contorted, the valves chartaceous, reddish within, not segmented; flowers uniform (not heteromorphic); armed trees and shrubs with spinescent stipules. 13. *Pithecellobium*

Leaflets alternate, numerous, the leaves usually with raised glands on petiole and rachis; inflorescences axillary and spicate or subterminal and paniculate; fruits straight, often densely tomentose, indehiscent or tardily dehiscent; indigenous trees. 14. *Serianthes*

1. **PARKIA** R. Br. in Denham & Clapperton, Narr. Travels Africa, 234. 1826; A. C. Sm. in J. Arnold Arb. 36: 279. 1955; Brenan in Fl. Trop. E. Afr. Leg. Mimos. 7. 1959; Hutchinson, Gen. Fl. Pl. 1: 280. 1964; Verdcourt, Man. New Guinea Leg. 132. 1979.

Unarmed trees; leaves bipinnate, the pinnae and leaflets numerous, the petiole usually glandular; inflorescences large, capitate, the heads solitary or in panicles, abruptly contracted proximally, sometimes constricted in middle, the peduncles axillary and solitary or several and subterminal; flowers numerous, congested, presumably bat-pollinated, heteromorphic, the distal ones ♀, the proximal ones ♂ or sterile; calyx infundibular or tubular, with 4 or 5 short, imbricate teeth; petals 5, linear or spatulate, free or connate below middle; stamens 10, the filaments proximally connate and sometimes adnate to corolla tube, the anthers oblong, eglandular, the pollen shed in dissymmetric polyads; ovary usually stipitate, the ovules numerous; fruits elongate-oblong, straight or curved, compressed, fleshy and becoming woody, indehiscent or 2-valved, the seeds ellipsoid or oblong-ellipsoid, somewhat compressed.

TYPE SPECIES: *Parkia africana* R. Br., nom. illeg. (*Mimosa biglobosa* Jacq.).

DISTRIBUTION: Pantropical, with about 40 species. The range of the Asian-Malesian segment of the genus seems to terminate in the Solomon and Caroline Islands except for an outlying endemic species in Fiji.

1. **Parkia parrii** Horne ex Baker in J. Linn. Soc. Bot. 20: 359. 1883; Drake, Ill. Fl. Ins. Mar. Pac. 159. 1890; A. C. Sm. in J. Arnold Arb. 36: 279. 1955; J. W. Parham, Pl. Fiji Isl. 70. 1964, ed. 2. 107. 1972.

Parkia pari Horne, A Year in Fiji, 266, nom. nud. 1881.

The Fijian species of *Parkia* is said to be a tree 12-21 m. high, occurring at low elevations near streams; its branchlets are copiously lenticellate and its leaves (including a petiole about 5 cm. long) attain a length of 30 cm. The turbinate inflorescences are 3.5-5 cm. long, with white or rose-colored flowers; the fruits are about 15 × 3.5 cm., with 10-12 seeds. The only available collection bore inflorescences and fruits in September.

TYPIIFICATION: The type is *Horne 1041* (K HOLOTYPE), collected in September, 1878; two localities are given: Parr's coffee plantation on Viti Levu, and Mbua, Mbua Province, Vanua Levu. Horne's handwritten label in part indicates: "Not common at the Rewa—Parr's coffee plantation—and near streams at Bua Vanua Levu Sept. 1878." Although the collection could possibly be from the two localities, the date suggests that it was obtained in Mbua Province (cf. Vol. 1 of this *Flora*, p. 51); Horne's visits to the Rewa River took place at earlier dates. Perhaps he merely observed it (or thought that he did) at Parr's coffee plantation (which I have been unable to locate but which could have been in either Rewa, Naitasiri, or Tailevu Province).

DISTRIBUTION: Endemic to Fiji and known only from the type collection. There seems no reason to doubt that *Parkia parrii* is indigenous in Fiji; Horne seems to have had a knack for finding plants that have eluded more recent collectors, as also suggested by his Fijian record of *Neosalsomitra* (Cucurbitaceae); cf. Vol. 2 of this *Flora*, pp. 687–688.

LOCAL NAME AND USE: Horne records the name *vaivai* (used for many legumes with finely divided leaves) and indicates that the timber is used for various purposes.

The Fijian species is probably most closely related to *Parkia versteeghii* Merr. & Perry, of New Guinea and the Solomon Islands, differing in the fewer (6- or 7-paired) pinnae and the fewer (12–16-paired) and substantially larger (12–15 × 7–9 mm.) leaflets.

2. *ADENANTHERA* L. Sp. Pl. 384. 1753; Brenan in Fl. Trop. E. Afr. Leg. Mimos. 30. 1959; Hutchinson, Gen. Fl. Pl. 1: 287. 1964; Verdcourt, Man. New Guinea Leg. 135. 1979.

Unarmed trees, the stipules small, caducous; leaves bipinnate, without glands, the leaflets alternate, several per pinna; inflorescences axillary or aggregated in terminal panicles composed of slender, spiciform racemes; flowers usually ♂, 5-merous, with jointed pedicels; calyx campanulate, short-dentate; petals joined proximally or soon free; stamens 10, the filaments free or connate at extreme base, the anthers with a stalked, fugacious, apical gland; ovary sessile, the ovules numerous; fruits linear, at first straight, becoming falcate, dehiscent into 2 thin valves, these spirally twisted after dehiscence, the seeds numerous, hard, subpersistently attached to valves, reddish (as in our species) or bicolored.

TYPE SPECIES: *Adenanthera pavonina* L., the only original species.

DISTRIBUTION: Tropical and subtropical Asia to Malesia and Australia, with about eight species; one species is now widespread and is naturalized in Fiji.

1. *Adenanthera pavonina* L. Sp. Pl. 384. 1753; Guillaumin in J. Arnold Arb. 12: 247. 1931; Christophersen in Bishop Mus. Bull. 128: 98. 1935; Yuncker in op. cit. 178: 59. 1943; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 91. 1948, in op. cit. 29: 31. 1959; Yuncker in Bishop Mus. Bull. 220: 131. 1959; Brenan in Fl. Trop. E. Afr. Leg. Mimos. 30. 1959; J. W. Parham, Pl. Fiji Isl. 68. 1964, ed. 2. 104. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 120. 1970; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 49, 67. 1972; Verdcourt, Man. New Guinea Leg. 138. fig. 34. 1979.

As seen in Fiji, *Adenanthera pavonina* is a sometimes spreading tree 6–15 m. high (up to 20 m. elsewhere), introduced but now thoroughly naturalized along roads, in dry forest, and occasionally in dense forest, at elevations from near sea level to about 600 m. The leaves have 3–5 pairs of pinnae, each with 5–9 leaflets per side, these with blades

1.5–4.5 × 1.2–2.3 cm. The petals are white to pale yellow like the filaments; the fruit valves are brown without and yellow within, and the seeds are evenly scarlet to brick-red. Flowers and fruits are commonly seen in November and December but doubtless occur through much of the year.

LECTOTYPIFICATION: The type is *Hermann* (BM LECTOTYPE), from Ceylon, fide Brenan (1959, cited above).

DISTRIBUTION: Southeastern Asia and Malesia, widely cultivated and naturalized elsewhere. It may be a comparatively recent introduction into Fiji, where its first record may be that of Thurston (cf. this *Flora*, vol. 1, pp. 47, 87). Even now it is not abundant, all available collections being cited below.

LOCAL NAMES AND USES: Recorded Fijian names are *lera*, *lere ndamu*, *vaivai*, *vaivai ni vavalangi*, and *pomea*. Seeds of the *red bead tree* are made into necklaces; elsewhere the wood is used for furniture and building.

AVAILABLE COLLECTIONS: VITI LEVU: NADRONGA & NAVOSA: Nausori, *DA 327*. SERUA: Namboutini, *DF 508*, *Damanu 147*; hills west of Waivunu Creek, between Ngaloa and Korovou, *Smith 9463*; hills between Waininggere and Waisee Creeks, between Ngaloa and Wainiyambia, *Smith 9350*. NAITASIRI: Naitauvoli, Waingga Creek, *DA 7008*. TAILEVU: Between Ndaku and Mburetu, *DA 877*. REWA: Kalokolevu, *DA 11015*. VANUA LEVU: MATHUATA: Vuo, Korondongo Bay, *DA*, May 10, 1947. LAKEMBA: Near Nukunuku Village, *Garnock-Jones 805*; near Tumbou Village, *Garnock-Jones 978*. FIJI without further locality, *DA 3153*.

3. *ENTADA* Adanson, *Fam. Pl.* 2: 318. 1763; Seem. *Fl. Vit.* 71. 1865; Brenan in *Fl. Trop.*

E. Afr. Leg. Mimos. 9. 1959; Hutchinson, *Gen. Fl. Pl.* 1: 288. 1964; Verdcourt, *Man. New Guinea Leg.* 134. 1979. *Nom. cons.*

Trees, shrubs, or lianas, sometimes with prickly stems and rachises, the stipules small, setaceous; leaves bipinnate, the rachis (as in our species) sometimes terminating in a bifid tendril, the leaflets few (as in our species) to many, usually opposite; inflorescences axillary or terminal, spicate or spiciform-paniculate; flowers ♀ or ♂, 5-merous, sessile; calyx campanulate, short-dentate; petals free or proximally connate; stamens 10, exserted, the filaments adnate to petals at base, the anthers with an apical, caducous gland; ovary subsessile to stipitate, the ovules numerous, the style tip tubular; fruits straight or curved, often very large, compressed, the sutures thickened, continuous in a persistent replum, the valves transversely jointed, breaking away from sutures and splitting into 1-seeded segments, the endocarp persistent around seeds, the seeds orbicular or ellipsoid, flattened, often smooth and polished.

TYPE SPECIES: *Entada monostachya* DC. (*Mimosa entada* L.).

DISTRIBUTION: Pantropical, most numerous in Africa, with about 30 species. One widespread species is indigenous in Fiji.

1. *Entada phaseoloides* (L.) Merr. in *Philipp. J. Sci. Bot.* 9C: 86. 1914, *Interpret. Rumph. Herb. Amb.* 253. 1917; Christophersen in *Bishop Mus. Bull.* 128: 98. 1935; I. M. Johnston in *Sargentia* 8: 137. 1949; Yuncker in *Bishop Mus. Bull.* 220: 131. 1959; J. W. Parham, *Pl. Fiji Isl.* 69. 1964, ed. 2. 106. 1972; St. John & A. C. Sm. in *Pacific Sci.* 25: 328. 1971; B. E. V. Parham in *New Zealand Dept. Sci. Indust. Res. Inform. Ser.* 85: 133. 1972; Verdcourt, *Man. New Guinea Leg.* 134. *fig. 33*. 1979; Henty in *Papua New Guinea Dept. Forests Bull.* 12: 86. *fig. 51*. 1980.

FIGURE 14.

Lens phaseoloides L. *Herb. Amb.* 18. 1754.

Mimosa scandens L. *Sp. Pl.* ed. 2. 1501. 1763.

Entada scandens Benth. in *J. Bot. (Hooker)* 4: 332. 1841; A. Gray, *Bot. U. S. Expl. Exped.* 1: 473. 1854; Seem. in *Bonplandia* 9: 255. 1861, *Viti*, 435. 1862, *Fl. Vit.* 71. 1865, *op. cit.* 427. 1873; Drake, *Ill. Fl. Ins. Mar. Pac.* 159. 1890; Guillaumin in *J. Arnold Arb.* 12: 245. 1931.



An often high-climbing liana, with very stout stems, occurring from near sea level to about 900 m. in dense forest or on its edges, in crest thickets, and sometimes near beaches and in mangrove swamps. The leaves have 1 or 2 pairs of pinnae, the rachis terminating in a tendril, and the pinnae have 1–3 pairs of large leaflets (up to 11×6.5 cm.). The slender flowering spikes are as long as 35 cm. and are often longepedunculate, with fragrant flowers. The calyx and petals are greenish and tinged with deep red or purple, and the stamens have white to yellowish filaments and yellow anthers. The large fruits, up to 150×13 cm., are somewhat contracted between the seeds, which are brown and as large as $5 \times 4.5 \times 1.5$ cm. Flowers and fruits are seen throughout the year.

TYPIFICATION: *Lens phaseoloides* is based entirely on *Faba marina major* Rumph. Herb. Amb. 5: 5. t. 4. 1747. The aggregate species *Mimosa scandens* may be typified by the same Rumphian element (cf. I. M. Johnston, 1949, cited above).

DISTRIBUTION: Tropical Asia from China throughout Malesia and eastward in the Pacific at least to the Cook Islands. In Fiji it may be expected on most islands that support a forest; 47 collections have been examined, but the species is more frequent than this implies.

LOCAL NAMES AND USES: This well-known plant throughout Fiji is called *wa lai, wa tinggiri, wa tanggiri, wa ndamu*, or *soni ni veikau*; the usual English name is *water vine*. Hanging loops of the stout stems contain substantial amounts of potable water, and the smaller stems are used to bind timbers in house-building or as fibers in making bamboo rafts. The seeds (*ai thimbi, ai lavo*) are roasted with *kaile* (*Dioscorea* spp.) and eaten, but they are more favored in children's games, being used as dart-heads or skimmed over *Pandanus* mats toward a goal. Parts of the plant are said to be used in treating rheumatic pains on Taveuni.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: North of Lomolomo, *Degener & Ordenez 13725*; northern portion of Mt. Evans Range, between Mt. Vatuyani and Mt. Natondra, *Smith 4302*; Nandala Creek, south of Nandarivatu, *Smith 6253*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 11726*. SERUA: Navutulevu, *Howard 58*; hills west of Waivunu Creek, between Ngaloa and Korovou, *Smith 9497*; near Navua, *Vaughan 3289*. NAMOSI: Hills bordering Wainavindrau Creek, vicinity of Wainimakutu, *Smith 8851*; Mt. Voma, *Gillespie 2502*. NAITASIRI: Wainisavulevu Creek, Wainimala Valley, *St. John 18291*; Vina, *Parks 20424*; vicinity of Nasinu, *Gillespie 3401*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7034*; near Londoni, *DA 14417*. VITI LEVU without further locality, *Seemann 139*. KANDAVU: Namalata isthmus region, *Smith 19*. OVALAU: Vicinity of Levuka, *Gillespie 4478*. KORO: Eastern slope of main ridge, *Smith 1004*. VANUA LEVU: MATHUATA: Mountains along coast, *Greenwood 642*. THAKAUNDROVE: Hills between Vatukawa and Wainio Rivers, Ndrekeniwa Valley, *Smith 580*; vicinity of Savusavu, *Bierhorst F213*. TAVEUNI: Waitavala Estate, *Weiner 71-7-2A*. MOALA: *Bryan 309*. MATUKU: *Bryan, July 3, 1924* (BISH, fruit only). VANUA MBALAVU: Slopes of Korolevu, near Lomaloma, *Garnock-Jones 1018*. LAKEMBA: *Harvey, Nov. 1855*; between Yandrana and Vakano, *Garnock-Jones 951*. MOTHE: *Bryan 478*. FIJI without further locality, *U. S. Expl. Exped.*

4. PROSOPIS L. Syst. Nat. ed. 12. 2: 282, 293. 1767; Mant. 10, 68. 1767; Brenan in Fl. Trop. E. Afr. Leg. Mimos. 34. 1959; Hutchinson, Gen. Fl. Pl. 1: 289. 1964; Burkart in J. Arnold Arb. 57: 200. 1976; Verdcourt, Man. New Guinea Leg. 139. 1979.

Trees or shrubs, usually xerophilous, often armed with prickles, axillary spines, or spinescent stipules; leaves bipinnate, usually with small glands on rachises, the pinnae

FIGURE 14. *Entada phaseoloides*: A, distal portion of stem, showing one leaf (the lower pair of pinnae fallen), a tendril terminating the rachis, and two inflorescences, $\times 1/4$; B, portion of rachis with flowers, $\times 4$; C, mature fruit breaking up, leaving the replum, the outer woody layer falling away from the two upper 1-seeded segments to leave the inner layer persisting around the seeds, $\times 1/4$; D, old seeds, the lower one starting to germinate, $\times 1$. A & B from *Smith 9497*, C from *Bryan 309*, D from *Bryan, July 3, 1924*.

1 or 2 (rarely numerous) pairs, the leaflets opposite or subopposite, 1—several pairs; inflorescences axillary, spicate or spiciform-racemose, rarely capitate; flowers small, ♂, 5-merous; calyx campanulate, short-dentate; petals free or proximally connate; stamens 10, free, the anthers usually with an inconspicuous apical gland; ovary stipitate, the ovules numerous, the style tip tubular; fruits straight, curved, or coiled, thick, indehiscent, compressed or subcylindric, the mesocarp usually thick and spongy, the endocarp cartilaginous or papery, continuous with septa between seeds, the seeds 3—many, hard, ovoid, compressed.

TYPE SPECIES: *Prosopis spicigera* L. (= *P. cineraria* (L.) Druce).

DISTRIBUTION: Tropics and subtropics, mostly in America, with about 44 species. Several species are cultivated and naturalized outside their indigenous areas for shade or forage, one having been introduced into Fiji but perhaps not persisting there.

LOCAL NAMES: Species of *Prosopis* are widely known as *algaroba* or *mesquite*.

USEFUL TREATMENT OF GENUS: BURKART, A. A monograph of the genus *Prosopis* (Leguminosae subfam. Mimosoideae). *J. Arnold Arb.* 57: 219–249, 450–525. 1976.

1. *Prosopis* sp.

Prosopis chilensis sensu B. E. V. Parham in *Agr. J. Dept. Agr. Fiji* 10: 116. 1939; J. W. Parham, *Pl. Fiji Isl.* ed. 2. 107. 1972; dubie Stuntz.

AVAILABLE COLLECTION: VIII LEVU: RA: Yanggara, *DA 5578* (SUVA).

The first record of the cultivation of a species of *Prosopis* in Fiji is that of B. E. V. Parham (1939), who indicated that the plant had been introduced in 1918 and in 1939 was established on the property of W. L. Wallace, Tovu Island, Ra Province, Viti Levu. J. W. Parham's 1972 record refers to *DA 5578*, from a plant which in 1945 was growing on the Yanggara Estate of the Colonial Sugar Refining Co. but did not appear to flourish.

It is doubtful that either of these records is referable to *Prosopis chilensis* (Molina) Stuntz, which is not noted by Burkart (1976, cited above) as being cultivated in the Pacific area. More likely the Fijian material represents either *P. pallida* (Humb. & Bonpl. ex Willd.) H. B. K., which is thoroughly naturalized in Hawaii and is infrequently cultivated in Australia, or *P. juliflora* (Sw.) DC., which is cultivated or naturalized in New Guinea, Queensland, Java, Ceylon, and perhaps elsewhere in the Pacific.

5. MIMOSA L. *Sp. Pl.* 516. 1753; Seem. *Fl. Vit.* 72. 1865; Brenan in *Fl. Trop. E. Afr. Leg. Mimos.* 42. 1959; Hutchinson, *Gen. Fl. Pl.* 1: 282. 1964; Verdcourt, *Man. New Guinea Leg.* 147. 1979.

Herbs or shrubs, less often trees, sometimes scrambling or climbing, usually armed with prickles or stipular thorns; leaves bipinnate (rarely reduced to phyllodes but not in any of our species), eglanular, the pinnae with few to many pairs of leaflets, these opposite or subopposite; inflorescences capitate or spicate, axillary and solitary or fasciculate or the distal ones racemiform; flowers small, sessile, ♂ or ♂, 3–6-merous; calyx usually minute, irregularly or minutely dentate, sometimes pappuslike; corolla gamopetalous, 4(3–6)-lobed; stamens as many as or twice as many as corolla segments, exerted, the filaments free, the anthers small, eglanular; ovary usually sessile, the ovules 2 or more; fruits flat, straight or coiled, usually prickly with bristles, 2-valved, the valves separating from sutures to form 1-seeded segments and leaving a persistent replum, rarely remaining entire, the seeds ovoid or subglobose.

LECTOTYPE SPECIES: *Mimosa sensitiva* L. (vide Britton & Wilson, *Sci. Surv. Porto Rico* 5: 357. 1924), one of Linnaeus's 39 species.

DISTRIBUTION: Tropical and subtropical, mostly American, with 400–450 species. Three species are naturalized in Fiji.

KEY TO SPECIES

Leaves without prickles on petiole and rachis (but sometimes hispid); pinnae in 1 or 2 pairs, very sensitive, subdigitately borne on a very short rachis, this much exceeded by the petiole; leaflets 10–26 pairs, 6–15 × 1.2–3 mm.; stamens 4, as many as corolla lobes; fruits setose-prickly only on margins, 1–1.5 cm. long, 0.2–0.4 mm. broad, 2–5-jointed; our variety with the corolla glabrous or nearly so even in bud, the heads in bud with no or few projecting setiform hairs; coarse herb or scrambling shrub to 0.5 m. high.

1. *M. pudica* var. *unijuga*

Leaves with pinnae in 3–10 pairs, not subdigitate, the rachis longer than the petiole; leaflets 11–40 pairs, 2–12 × 0.7–2.5 mm.; stamens twice as many as corolla lobes; scrambling shrubs forming tangled masses to 2 m. high (or becoming treelike and to 8 m. high).

Fruits 1–3.5 cm. long, 4–6 mm. broad, 3–5-jointed, setose-prickly on margins and on surfaces of valves; corolla 4-lobed; stamens 8; pinnae 2–4 cm. long; leaflets 11–30 pairs, 2–6 mm. long.

2. *M. invisa*

Fruits 4–5 cm. long, 7–8 mm. broad, 5–8-jointed, unarmed; corolla 5-lobed; stamens 10; pinnae 4–7 cm. long; leaflets 15–40 pairs, 5–12 mm. long; mature stems terete or inconspicuously 5-angled, the prickles of the same longitudinal row 1–4 cm. apart, coarse, 4–6 mm. long, 4–7 mm. thick along basal attachment. 3. *M. bimucronata*

1. *Mimosa pudica* L. var. *unijuga* (Duchass. & Walp.) Griseb. in Abh. Königl. Ges. Wiss. Göttingen 7: 211. 1857; Brenan in Fl. Trop. E. Afr. Leg. Mimos. 47. 1959; Verdcourt, Man. New Guinea Leg. 151. fig. 40. 1979.

Mimosa unijuga Duchass. & Walp. in Linnaea 23: 744. 1850.

Mimosa pudica sensu Seem. in Bonplandia 9: 255. 1861, Viti, 436. 1862, Fl. Vit. 72. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 159. 1890; Guillaumin in J. Arnold Arb. 12: 248. 1931; Yuncker in Bishop Mus. Bull. 178: 59. 1943; Greenwood in Proc. Linn. Soc. 154: 98. 1943; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 103. 1948, in Dept. Agr. Fiji Bull. 35: 86. fig. 43. 1959; Yuncker in Bishop Mus. Bull. 220: 130. 1959; J. W. Parham, Pl. Fiji Isl. 69. 1964, ed. 2. 107. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 122. 1970; St. John & A. C. Sm. in Pacific Sci. 25: 328. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 48, 133, 142, 147. 1972; non sensu str.

An abundantly naturalized weed in cultivated areas, along roadsides, in pastures, on waste land, and forming mats on the dry mud of river banks, at elevations up to about 500 m. It is a coarse herb or scrambling shrub, usually semiprostrate but occasionally shrubby, seldom more than 0.5 m. high, with pale pink to lavender filaments. Flowers and fruits occur throughout the year.

TIPIFICATION AND NOMENCLATURE: The type of *Mimosa pudica* L. (Sp. Pl. 518. 1753) came from a plant (BM LECTOTYPE) cultivated in Hortus Cliffortianus; that of *M. unijuga* is *Duchassaing* (ISOLECTOTYPE at GOET, fide Brenan, 1959, cited above), collected on Guadeloupe. Most of the Pacific material, including that of Fiji, appears to represent var. *unijuga*, but var. *tetrandra* (Humb. & Bonpl. ex Willd.) DC. also occurs in some archipelagoes.

DISTRIBUTION: The species as a whole was probably originally South American, but it is now a pantropical weed, widespread in the Pacific, including Hawaii. Twenty-five Fijian specimens have been examined, but the taxon may be anticipated around every settlement.

LOCAL NAMES: *Tho ngandrongandro*, *tho kandrokandro* (in Lau), *sensitive plant*, *sensitive grass*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Lautoka, Greenwood 392; shores of Mba River near its mouth, Smith 4750. NANDRONGA & NAVOSA: Near Ndumbulevu, upper Singatoka Valley, DA 11352. SERUA: Tokotoko, Navua, DA 9456. RA: Yanggara, Greenwood 392A. NAITASIRI: Koronivia, DA 4047. TAILEVU: Mbau road, near Kuku, DA 10617; Wainimbokasi, DA 10579. REWA: Suva, DA 12267. VANUA LEVU: MBUA: Vicinity of Mbuu, DA 5028. THAKAUNDRIVE: Mbalanga, Savusavu Bay, DA 9107. TAVEUNI: Mt. Vernon Estate, DA 4048. VANUA MBALAVU: Near Ndelana, Lomaloma, DA 10223

LAKEMBA: Near Tumbou Jetty, *Garnock-Jones* 775. FIJI without further locality, *Seemann* 140. *U. S. Expl. Exped.*

Although *Mimosa pudica* was established in Fiji before 1840, Seemann's (1865) suggestion that it might be indigenous is surely erroneous.

2. *Mimosa invisa* Mart. ex Colla, *Herb. Pedemont.* 2:255. 1834; Verdcourt, *Man. New Guinea Leg.* 147. 1979.

KEY TO VARIETIES

Plants with mature stems 5-angled, with copiously superposed prickles 2-4 per cm. on each angle, the prickles slender, 2-3 mm. long, abruptly narrowed from the longitudinally attached base, this 1-4 mm. thick. 2a. var. *invisa*
Plants unarmed. 2b. var. *inermis*

2a. *Mimosa invisa* var. *invisa*; Verdcourt, *Man. New Guinea Leg.* 148. *fig. 38A*, 39. 1979.

Mimosa invisa sensu B. E. V. Parham in *Agr. J. Dept. Agr. Fiji* 13:50. 1942; A. C. Sm. in *Bull. Torrey Bot. Club* 70:540. 1943; Greenwood in *J. Arnold Arb.* 25:399. 1944; Mune in *Agr. J. Dept. Agr. Fiji* 24:53. 1953; Mune & J. W. Parham in *Dept. Agr. Fiji Bull.* 31:28. *fig. 6*. 1957; J. W. Parham in *op. cit.* 35:85. *fig. 42*. 1959; Brenan in *Fl. Trop. E. Afr. Leg. Mimos.* 45. 1959; J. W. Parham, *Pl. Fiji Isl.* 69. 1964, ed. 2. 107. 1972; Mune & J. W. Parham in *Dept. Agr. Fiji Bull.* 48:18. *fig. 3*. 1967; B. E. V. Parham in *New Zealand Dept. Sci. Indust. Res. Inform. Ser.* 85:48. 1972.

Schrankia distachya sensu A. C. Sm. in *Sargentia* 1:36. 1942; non DC.

The abundant form of *Mimosa invisa* is a spreading or sprawling shrub, forming dense, tangled masses up to 1.5 m. high in cultivated fields and pastures and on plantations. The filaments are pink and the seeds pale brown. It is usually seen sterile, but flowers have been obtained in Fiji in September and fruits in October.

TYPIFICATION: The type is *Martius* (*Herb. Fl. Bras.* 172) (ISOTYPE κ), from Brazil.

DISTRIBUTION: Tropical America, but now introduced and sometimes naturalized in other tropical areas. In the Pacific it has been noted at least from Java, New Guinea, the Mariana and Caroline Islands, and Samoa, as well as Fiji.

LOCAL NAMES: Fijian names for the *giant sensitive plant* are *wa ngandongandro levu* and *wa ngandongandro ni wa ngalelevu*. The thorny form (var. *invisa*), far from being of any use, can form impenetrable thickets.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vatualevu, Nandi, *DA* 9720; Lengalenga, near Nandi, *Greenwood* 838A (coll. *D. A. Donald*); Mba, *DA* 4044; Mba without further locality, *DA* L.15628. NANGRONGA & NAVOSA: Agricultural Station, Nathotholevu, Singatoka, *Greenwood* 838. TAILEVU: Korovou, *DA* 4045. TAVEUNI: Mt. Vernon Estate, *DA* 8945.

This aggressive weed was accidentally introduced from Malaya in 1936 with seeds of *Centrosema* and *Calopogonium*. It is a declared noxious weed in Fiji but is now largely under control; methods of control are detailed by Mune and Parham (1957, 1967).

2b. *Mimosa invisa* var. *inermis* Adelb. in *Reinwardtia* 2:359. 1953; Verdcourt, *Man. New Guinea Leg.* 148. *fig. 38B*. 1979.

The unarmed variety of *Mimosa invisa* was discovered in Java; it is widely cultivated as a cover crop and as such is obviously preferable to var. *invisa*.

TYPIFICATION: The variety is based on *A. J. H. van Haaren s. n.*, Nov. 14, 1950, cultivated in experimental gardens at Bogor, Java.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Plant Introduction and Quarantine Station, Nanduloulou, *DA* 9563.

This unarmed variant should probably be considered a cultivar rather than a botanical variety. Mune and Parham (1967, cited above) state: "A thornless strain developed overseas as a pasture legume has been abandoned because of its tendency to

revert to the thorny type and because it was found to have some toxic properties." In Fiji this strain is now grouped with the typical variety as an undesirable noxious weed. In the Pacific it is also known from Hawaii and doubtless elsewhere.

3. *Mimosa bimucronata* (DC.) Kuntze, Rev. Gen. Pl. 1: 198. 1891; J. W. Parham, Pl. Fiji Isl. ed. 2. 107. 1972.

Acacia bimucronata DC. Prodr. 2: 469. 1825.

Mimosa sepiaria Benth. in J. Bot. (Hooker) 4: 395. 1842; Ridley in Kew Bull. 1938: 280. 1938.

As seen in Fiji, *Mimosa bimucronata* is naturalized on open land and along roadsides near sea level; it is a scrambling, copiously armed shrub 1–2 m. high (noted elsewhere as a small tree up to 8 m. high). The only available fertile specimen was flowering in September.

TIPOFICATION: The type of *Acacia bimucronata* is *Raddi* (Herb. Moricand, G HOLOTYPE), from Brazil. For *Mimosa sepiaria* Benthham cited many collections, among which a lectotype should be designated.

DISTRIBUTION: Indigenous in Brazil, but naturalized elsewhere (at least in Jamaica and Guyana) in tropical America and also in Singapore, possibly the source of the Fijian introduction. Many varieties have been described by Hassler (in Repert. Sp. Nov. 9: 2. 1910), but Velva E. Rudd, who kindly verified the identification, puts little credence in them.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Uthiwai, Lautoka, DA 11413; Varoka, near Mba, DA 3158; Ndramasi, DA 9468. VANUA LEVU: MATHUATA: Mbuthalevu Estate, near Lambasa, DA 16675, L.15585.

Mimosa bimucronata was introduced into Singapore as a hedge and firewood plant (Ridley, 1938, cited above), and it has also been recorded from China and Malaya. The earliest available Fijian collection is DA 3158 (coll. T. L. Mune, Sept. 13, 1952). A more recent introduction was made in the Lambasa area from seeds brought from India in 1952 by a local merchant, who claimed that an outstanding chutney was made from the fruits. The plant is potentially a serious pest, quickly forming impenetrable thorny thickets; even when it is sterile, its stems and thorns permit its ready separation from *M. invisa*, as suggested by the above keys.

6. *LEUCAENA* Benth. in J. Bot. (Hooker) 4: 416. 1842; Seem. Fl. Vit. 72. 1865; Brenan in Fl. Trop. E. Afr. Leg. Mimos. 48. 1959; Hutchinson, Gen. Fl. Pl. 1: 281. 1964; Verdcourt, Man. New Guinea Leg. 154. 1979.

Unarmed trees or shrubs, the stipules small, setaceous; leaves bipinnate, the petiole often glandular distally, the pinnae opposite, the leaflets few to many pairs, opposite, often small, inaequilateral at base; inflorescences capitate, pedunculate, axillary, solitary or subfasciculate, the distal ones racemiform, the bracts persistent, spatulate, the peduncle with an involucrel; flowers 5-merous, ♀, sessile; calyx tubular or campanulate, short-dentate; petals free; stamens 10, exerted, the filaments free, the anthers often pilose (as in our species), eglandular; ovary stipitate, the ovules numerous, the style tip tubular or infundibular, pilose; fruits stipitate, linear to oblong, compressed, 2-valved, not septate, the valves thin, separating, not winged, the seeds transverse, compressed, brown and glossy, the endosperm scanty.

TYPE SPECIES: No typification has yet been indicated in ING (1979).

DISTRIBUTION: Tropical America, with 40–50 species. One widespread species is abundantly naturalized in Fiji.

1. *Leucaena leucocephala* (Lam.) de Wit in Taxon 10: 53. 1961; Fosberg in Occas. Pap. Bishop Mus. 23: 36. 1962; J. W. Parham, Pl. Fiji Isl. 69. 1964, ed. 2. 106. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 122. 1970; B. E. V.

Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 67, 121. 1972; Verdcourt, Man. New Guinea Leg. 154. *fig.* 42. 1979; Henty in Papua New Guinea Dept. Forests Bull. **12**: 90. *fig.* 53. 1980.

Mimosa glauca sensu L. Sp. Pl. ed. 2. 1504. 1763; non *M. glauca* L. Sp. Pl. 520. 1753 (= *Acacia glauca* Moench, Meth. Pl. 466. 1794).

Mimosa leucocephala Lam. Encycl. Méth. Bot. **1**: 12. 1783.

Acacia glauca sensu Willd. Sp. Pl. **4**: 1075. 1806; excl. basionymo *Mimosa glauca* L. (1753) = *Acacia glauca* Moench (1794).

Leucaena glauca (L. ex. Willd.) Benth. in J. Bot. (Hooker) **4**: 416. 1842; Seem. in Bonplandia **9**: 255. 1861, Viti, 436. 1862, Fl. Vit. 73. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 160. 1890; Guillaumin in J. Arnold Arb. **12**: 248. 1931; W. L. Parham in Agr. J. Dept. Agr. Fiji **9**(1): 18. 1938; Yunker in Bishop Mus. Bull. **178**: 58. 1943; Greenwood in J. Arnold Arb. **25**: 399. 1944; Yunker in Bishop Mus. Bull. **220**: 129. 1959; J. W. Parham in Dept. Agr. Fiji Bull. **35**: 83. *fig.* 41. 1959; Brennan in Fl. Trop. E. Afr. Leg. Mimos. **48**. 1959; excl. basionymo *Mimosa glauca* L. (1753).

A shrub or slender, small tree 1–8 m. high, abundantly naturalized from near sea level to about 800 m. along roadsides, in cultivated areas and in pastures, on dry river banks or open gravel banks in forest, often forming dense thickets. The leaves usually have 3–10 pairs of pinnae, each with (5–) 7–17 (–21) pairs of leaflets 6–19 × 1.5–5 mm. The petals are pale green or white; the stamens have white filaments and pale yellow anthers; and the mature fruits are brown, 8–20 cm. long, (1.4–) 1.8–2.2 cm. broad, and with 18–25 brown, shiny seeds. Flowers and fruits are found throughout the year.

TIPIFICATION AND NOMENCLATURE: The holotype is a specimen in the Lamarck herbarium (P), presumably taken from a plant growing in the Jardin du Roi. The binomial *Mimosa glauca* was used twice by Linnaeus, in 1753 and 1763, but his descriptions were not based on the same concept. The usage of 1753 is referable to *Acacia glauca* (L.) Moench. The usage of 1763, which was the actual basis of the binomials of Willdenow and Bentham, is referable to *Leucaena*, but the epithet *glauca* cannot be used for this concept because of the earlier 1753 basionym. The earliest available epithet is that of Lamarck, 1783. Discussions of this complex nomenclature have been many; the interested reader is referred to: de Wit in Taxon **10**: 50–54. 1961; Gillis & Stearn in op. cit. **23**: 185–191. 1974; de Wit in op. cit. **24**: 349–352. 1975; Polhill & Stearn in op. cit. **25**: 323–325. 1976; Shaw & Schubert in J. Arnold Arb. **57**: 113–118. 1976.

DISTRIBUTION: Indigenous in tropical America but now worldwide in tropical areas. About 35 Fijian collections are at hand, but the species is becoming ubiquitous on Pacific islands.

LOCAL NAMES AND USES: *Vaivai* and *vaivai ni vavalangi*; *balori* (Hindi); in tropical America frequent names are *lead tree* and *jumbie bean*. In Fiji the species is considered useful as a low shade tree and a browse plant for stock, and in the Yasawas the roots are sometimes used to bleach hair. In most parts of the tropics *Leucaena leucocephala* was probably introduced as a browse plant, producing fodder rich in protein. However, the leaves and pods are considered poisonous to horses, causing them to lose hair; the effect of the plant on cattle and goats is less noticeable. The plants grow rapidly and produce wood useful for fuel. In some tropical countries strains have been developed that are promising sources of wood pulp for paper making. In many areas the species has become a notorious weed that replaces indigenous vegetation. It had been introduced before 1860 into Fiji, where Seemann found it in use as a hedge plant.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Along Wailevu Creek, *St. John 18079*. VITI LEVU: MBA: Lautoka, *Greenwood 215*; shores of Mba River near its mouth, *Smith 4730*; slopes of escarpment north of Nandarivatu, *Smith 6041*. NANDRONGA & NAVOSA: Navula, Valley road, *DA 11324*. NAMOSI: Hills east of Wainikoroiuva River, near Namuamua, *Smith 9062*; Lombau River, *Damanu 44*. RA: Mountains near Penang, *Greenwood 215A*. NAITASIRE: Koroniua, *DA 11912*. TAILEVU: Matavatathou, *DA 9947*;

Mbau Island, *Seemann 141*. REWA: Suva, *DA 12234*. KANDAVU: Western end of island, near Cape Washington, *Smith 252*. KORO: Eastern slope of main ridge, *Smith 1027*. VANUA LEVU: MATHUATA: Between Nanduri and Lekutu, *Tothill 131a*; Lambasa, *DA 10520*. THAKAUNDROVE: Savusavu, *DA 10759*. TAVEUNI: Vicinity of Waiyevo, *Gillespie 4691*. VANUA MBALAVU: Site of Lomaloma Botanical Gardens, *DA 10214*. LAKEMBA: Near Wathiwathi Village, *Garnock-Jones 942*.

7. *Schleinitzia* Warb. ex Guinet in Inst. Franç. Pondichéry Trav. Sci. Tech. **9**: 33. 1969; Verdcourt in Kew Bull. **32**: 231. 1977; Nevling & Niezgodna in *Adansonia* II. **18**: 356. 1978; Verdcourt, Man. New Guinea Leg. 157. 1979.

Schleinitzia Warb. in Bot. Jahrb. **13**: 336, nom. invalid. 1891; Warb. ex Harms in Bot. Jahrb. **55**: 39, nom. provis. 1917.

Unarmed trees or shrubs; leaves bipinnate, with glands on petiole and rachis and with 4–30 pairs of pinnae, the leaflets opposite, minute, obliquely rounded at base, 20–60 pairs per pinna; inflorescences capitate, pedunculate, axillary, solitary or fasciculate, the bracts persistent, spathulate, the peduncle with an involucre; flowers 5-merous, ♂ or a few functionally ♂; calyx infundibular, short-dentate; petals free, oblanceolate, longer than calyx; stamens 10, exserted, the filaments free or proximally loosely connate, the anthers with small, stalked, apical glands; ovary short-stipitate, the stigma minute, cupuliform; fruits oblong to broadly linear, straight or slightly curved, flat, indehiscent, the valves narrowly winged, splitting at edges but not separating over seed-chambers, the seeds 8–20, oblong, compressed, with endosperm.

TYPE SPECIES: *Schleinitzia novo-guineensis* (Warb.) Verdcourt (*Piptadenia novo-guineensis* Warb.; *Schleinitzia microphylla* Warb., nom. invalid.).

DISTRIBUTION: Philippine Islands and New Guinea to New Caledonia and the Mariana Islands and eastward to the Society and Austral Islands, with four species. One species is indigenous in Fiji.

USEFUL TREATMENT OF GENUS: NEVLING, L. I., & C. J. NIEZGODA. On the genus *Schleinitzia* (Leguminosae-Mimosoideae). *Adansonia* II. **18**: 345–363. 1978.

The first valid publication of *Schleinitzia* has been a subject of discussion. After describing it in 1891, Warburg in the same paper (p. 453) treated the name as a synonym of *Piptadenia*, thereby rendering it invalid (ICBN, Art. 34.1 (a)). Verdcourt in 1977 ascribed valid publication to Harms (1917), but Harms's use of the name seems definitely provisional (ICBN, Art. 34.1 (b)), as indicated by Nevling and Niezgodna (1978), who have accepted Guinet's 1969 usage as first validating the genus. The publication of Warburg in 1891 and the type species *S. microphylla* have been listed by ING (1979), but this seems incorrect.

1. *Schleinitzia insularum* (Guillemin) Burkart in J. Arnold Arb. **57**: 524. 1976; Nevling & Niezgodna in *Adansonia* II. **18**: 359. *pl. 1* (4–6), 3 (3, 4), 4 (A), *fig. 5*. 1978.

FIGURES 15 & 16.

Mimosa glandulosa Solander ex Forst. f. Fl. Ins. Austr. Prodr. **92**, nom. nud. 1786.

Acacia insularum Guillemin in Ann. Sci. Nat. II. **7**: 360. 1837 (repr. Zephyr. Tait. **66**. 1838).

Leucaena forsteri Benth. in London J. Bot. **5**: 94, nom. illeg. 1846; A. Gray, Bot. U. S. Expl. Exped. **1**: 477. 1854; Seem. in Bonplandia **9**: 255. 1861; Viti, 436. 1862; Fl. Vit. **72**. 1865; Drake, Ill. Fl. Ins. Mar. Pac. **160**. 1890.

Leucaena insularum Daniker in Viert. Naturf. Ges. Zürich **77** (Beibl. **19**): 176. 1932; Yuncker in Bishop Mus. Bull. **178**: 59. 1943, in op. cit. **220**: 130. 1959; J. W. Parham, Pl. Fiji Isl. **69**. 1964, ed. 2. **106**. 1972.

Prosopis insularum Breteler in Acta Bot. Neerl. **9**: 398. 1960.

Prosopis insularum subsp. *insularum*; Breteler in Acta Bot. Neerl. **9**: 398. *fig. 1*. 1960.

Leucaena insularum var. *insularum*; Fosberg & Stone in Micronesica **2**: 67. 1965; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 121. 1970.

As seen in Fiji, *Schleinitzia insularum* is a shrub or spreading tree 4–6 m. high, found near sea level along sandy beaches; elsewhere it has been noted as 2–15 m. high and with a trunk up to 45 cm. in diameter. Its leaves usually have (7–) 9–13 pairs of

pinnae, each with 25-35 pairs of leaflets $5.5-10 \times 1-2.5$ mm. The petals and filaments are white, and the fruits, dark brown to black at maturity, are 5.5-11.8 cm. long,

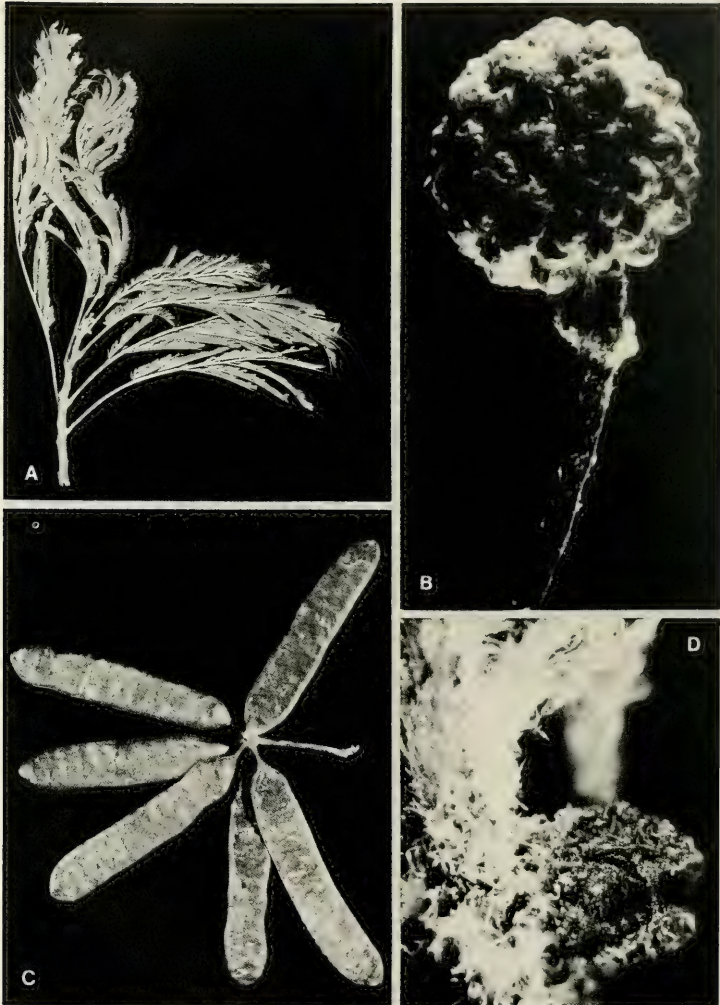


FIGURE 15. *Schleinitzia insularum*; A, distal portion of branchlet with foliage, $\times 1/3$; B, flowering head before anthesis, $\times 10$; C, mature fruits, $\times 1/2$; D, ostiolate gland on rachis between pinnae, $\times 30$. A & D from Bryan 350, B & C from Bryan 479.

1.2-1.9 cm. broad, and with 8-15 seeds. Our few dated specimens have flowers in August, fruits in July and August.

LECTOTYPIFICATION AND NOMENCLATURE: Nevling and Niezgodá (1978) designate *Bertero & Moerenhout* (P LECTOTYPE), collected on Tahiti in 1830 or 1831, as the type of *Acacia insularum*. Guillemín's original citation of "Lesson, Bertero, Moerenhout" apparently included a collection made by Lesson during the earlier voyage of *L'Astrolabe*. *Mimosa glandulosa* is a name probably taken from a specimen obtained on Cook's first voyage. *Leucaena forsteri* is illegitimate because Bentham cited *Acacia insularum* as a synonym.

DISTRIBUTION: Southern New Hebrides and New Caledonia eastward to the Society and Austral Islands. In Fiji the species seems neither common nor well known.

LOCAL NAME: *Vaivai ni papalangi* (recorded from Vanua Mbalavu). The wood is said to be used for handicrafts in Tonga, but no Fijian usage has been recorded.

AVAILABLE COLLECTIONS: VANUA LEVU: MATHUATA: Islands off coast, *Greenwood 684*. THAKAUNDROVE: Maravu Estate, *Degener & Ordonez 14179*. TAVEUNI: *Seemann 142*. TOTOYA: *Bryan 350*; on bank near lagoon, *Tothill 130*; beach opposite Tovu Village, *DA 17705*. VANUA MBALAVU: Near Sawana Village, *Garnock-Jones 1074*. MOTHE: *Bryan 479*. FIJI without further locality, *U. S. Expl. Exped.*

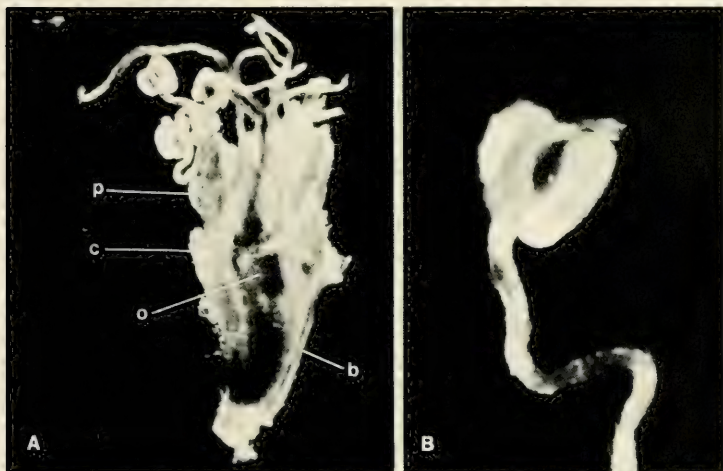


FIGURE 16. *Schleinitzia insularum*, from *Bryan 479*: A, flower, showing subtending bracteele (b), calyx (c), petal (p), ovary (o), and exerted style and stamens, some anthers fallen, $\times 20$; B, distal portion of filament and anther with apical gland, $\times 70$.

8. DESMANTHUS Willd. Sp. Pl. 4: 1044. 1806; Hutchinson, Gen. Fl. Pl. 1: 281. 1964; Verdcourt, Man. New Guinea Leg. 143. 1979. Nom. cons.

Shrubs or perennial herbs, the stipules subulate, persistent; leaves bipinnate, often with a petiolar gland, the leaflets small, opposite; inflorescences axillary, solitary, stalked, capitate or short-spicate; flowers ζ (lower ones neuter or σ and sometimes lacking petals but with staminodes), sessile, 5-merous; calyx campanulate, short-dentate; petals free or slightly coherent at base; stamens 5 or 10, exerted, the filaments

free, the anthers eglandular; ovary sessile, the ovules numerous, the style tip tubular; fruits sessile, linear, straight or falcate, flattened, 2-valved, the seeds longitudinal or oblique, ovoid, compressed.

TYPE SPECIES: *Desmanthus virgatus* (L.) Willd. (*Mimosa virgata* L.).

DISTRIBUTION: Tropical and subtropical America, with about 25 species; one widely naturalized species occurs in Fiji.

1. *Desmanthus virgatus* (L.) Willd. Sp. Pl. 4: 1047. 1806; Greenwood in Proc. Linn. Soc. 154: 93. 1943, in J. Arnold Arb. 30: 76. 1949; J. W. Parham, Pl. Fiji Isl. 69. 1964, ed. 2. 106. 1972; Verdcourt, Man. New Guinea Leg. 143. fig. 36. 1979.

Mimosa virgata L. Sp. Pl. 519. 1753.

As noted in Fiji, *Desmanthus virgatus* is a woody herb or low shrub 0.5–2 m. high, perhaps originally introduced for cultivation but now sparingly naturalized along shores and in waste places near sea level. Its leaves have 3–8 pairs of pinnae, each with 10–25 pairs of leaflets up to 9 × 2 mm. The flowers, in small heads of 6–10, have white petals and filaments. The narrow fruits at maturity are reddish brown, up to 10 cm. long and 4 mm. broad, with 20–30 brown seeds.

TYPIFICATION: Linnaeus noted prior references to his *Hortus Cliffortianus*, *Hortus Upsaliensis*, and *Flora Zeylanica*.

DISTRIBUTION: Indigenous in tropical America, but now widely naturalized elsewhere. The date of introduction into Fiji is not known, but the species may have been in cultivation at the Botanical Gardens on Vanua Mbalavu.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Near Lautoka, *Greenwood 1184*. NANDRONGA & NAVOSA: Experimental Farm, Singatoka (cultivated), *DA 4043*. NAITASIRE: Koronivia, *DA 4042*. OVALAU: Vuma, *DA 17038*. VANUA MBALAVU: Botanical Gardens, Lomaloma, *Tohill 135*; Lomaloma, *DA 10221*, *L.15791*.

9. ACACIA Mill. Gard. Dict. Abridg. ed. 4. 1754; Seem. Fl. Vit. 73. 1865; Brenan in Fl. Trop. E. Afr. Leg. Mimos. 49. 1959; Hutchinson, Gen. Fl. Pl. 1: 280. 1964; Verdcourt, Man. New Guinea Leg. 159. 1979.

Trees or shrubs, sometimes scrambling or climbing, often prickly or spiny, the stipules sometimes spinescent; leaves bipinnate, often with petiolar glands and small pinnae in numerous pairs or completely modified into phyllodes of petiolar origin (as in all our indigenous species) but sometimes pinnate or bipinnate in seedlings; inflorescences spicate or capitate, pedunculate, bracteate, axillary, solitary or fasciculate, or the distal ones racemiform or paniculiform; flowers small, usually 4- or 5-merous, ♂ or ♀ or ♂ and ♀; calyx campanulate, dentate or lobed (or sepals rarely free); corolla with as many lobes as calyx, these shorter than the tube; stamens numerous (30–200 or more), exserted, the filaments free or connate only at base, the anthers with or without a gland; ovary sessile or stipitate, the ovules usually many; fruits ovoid to linear, straight, curved, or variously contorted, flat to terete, membranaceous to woody, 2-valved or indehiscent, rarely articulated or moniliform, the seeds longitudinal or transverse, compressed, with a filiform funicle or fleshy aril, the testa hard.

LECTOTYPE SPECIES: *Acacia nilotica* (L.) Delile (*Mimosa nilotica* L.) (vide Britton & Rose in N. Amer. Fl. 23: 85. 1928).

DISTRIBUTION: Tropics and subtropics, especially of Africa and Australia, with about 1,200 species. The genus yields many valuable products, such as timber, gum arabic, bark used in tanning, and ornamentals.

USEFUL TREATMENTS OF GENUS: PEDLEY, L. Revision of the extra-Australian species of *Acacia* subgen. *Heterophyllum*. Contr. Queensland Herb. 18: 1–24. 1975. PEDLEY, L. A revision of *Acacia* Mill. in Queensland. Austrobaileya 1: 75–234. 1978, 235–337. 1979.

The large genus *Acacia* is represented in Fiji by three or four cultivated species, at least one noxious adventive, and three indigenous species, two of which are endemic.

KEY TO SPECIES

Plants with bipinnate leaves only, never with phyllodes; flowers in heads or spikes; cultivated and/or naturalized (subgen. *Acacia*).

Stipules conspicuously spiny, the spines straight, 4–30 mm. long; petioles 0.7–2 (–3) cm. long, with a gland near middle, the rachis sometimes with a gland between pinnae; pinnae (1–) 2–5 pairs, 1–4 cm. long, the leaflets 8–25 pairs, usually 3–6 × 1–1.5 mm.; flowers in globose heads, the peduncles 1–3 in axils and 1–3 cm. long; fruits subterete, curved, 5–7 cm. long, 8–15 mm. in diameter; originally cultivated but now widely naturalized. 1. *A. farnesiana*

Stipules inconspicuous, lanceolate, caducous; petioles usually 3–5 cm. long, eglandular (like rachis); pinnae (2–) 5 or 6 (–10) pairs, 4–7 cm. long, the leaflets (6–) 10–25 (–30) pairs, usually 5–7 × 1.5–3 mm.; flowers in short spikes, these axillary or forming a small terminal panicle, the peduncles 4–10 (–15) mm. long, the rachis 4–10 mm. long; fruits flattened, 3.5–8 cm. long, 8–15 mm. broad; cultivated only.

2. *A. curassavica*

Mature plants with phyllodes only (pinnate and bipinnate leaves found only on seedlings or on "reversion" shoots of old plants); indigenous or cultivated (subgen. *Heterophyllum*).

Flowers in spikes 5–8 cm. long; fruits up to 10 cm. long, 6–8 mm. broad; branchlets glabrous; phyllodes 6–9 times as long as broad, 9–17 (–23) cm. long, (13–) 16–23 (–25) mm. broad, with 2–4 prominent longitudinal secondary nerves with many fine anastomosing longitudinal secondary nerves (4 or 5 per mm.) between them; cultivated (sect. *Juliflorae*). 3. *A. polystachya*

Flowers in heads; phyllodes with several–many longitudinal nerves, some of them often more prominent than others; indigenous or cultivated (sect. *Phurinerives*).

Branchlets densely appressed-pilose, the indument caducous in patches; phyllodes usually 9–20 times as long as broad, 5–10 (–14) cm. long, 4–8 (–9) mm. broad, with 1–3 longitudinal nerves more prominent than others; flowering heads of 14–20 flowers in 2–4-branched axillary racemes; fruits 4–8 cm. long, 8–18 mm. broad, with a wing about 3 mm. broad along upper margin; cultivated.

4. *A. pendula*

Branchlets glabrous; phyllodes 1.4–9 times as long as broad, with 5–many equally prominent longitudinal nerves; flowering heads on a short axis 1–4 mm. long or appearing 1–8 and axillary, the peduncles glabrous; fruits up to 14 cm. long, narrowly winged on both margins, the wings not more than 0.5 mm. broad; indigenous.

Phyllodes 1.4–2.4 times as long as broad, 3.5–12.5 cm. long, 13–85 mm. broad, with 5–14 prominent longitudinal nerves with less prominent longitudinal nerves and reticulations between them; flowering heads of 25–45 flowers, the peduncles 2–13 mm. long; fruits 5–14 cm. long, 8–13 mm. broad (not known for *A. mathuataensis*).

Flowering heads of 25–30 flowers, the peduncles 5–13 mm. long; calyx irregularly divided into somewhat linear, subspathulate lobes; phyllodes 5–12.5 cm. long, 25–85 mm. broad, with 5–14 prominent longitudinal nerves 3–9 mm. apart and with irregular longitudinally oriented reticulations between them; fruits constricted between seeds, the valves obscurely or bluntly reticulate-veined; plant of the seashore and littoral forests. 5. *A. simplex*

Flowering heads of 35–45 flowers, the peduncles 2–6 (–7) mm. long; calyx with broad, subacute lobes; phyllodes 3.5–5 cm. long, 13–25 mm. broad, with 8–14 prominent longitudinal nerves 0.5–2 mm. apart and with a single less prominent longitudinal nerve and reticulate venation between them; plant of interior crest thickets. 6. *A. mathuataensis*

Phyllodes 4–9 times as long as broad, 5–8.5 cm. long, 7–19 mm. broad, with 7–14 prominent longitudinal nerves 0.5–1 mm. apart and with a single less prominent longitudinal nerve and faint reticulations between them; flowering heads of 10–20 flowers, the peduncles 4–8 mm. long; calyx obtusely dentate; fruits (3–) 6–10 cm. long, 12–25 mm. broad, not (or very slightly) constricted between seeds, the valves thin, conspicuously reticulate-veined; plant of interior forests or open hillsides. 7. *A. richii*

1. *Acacia farnesiana* (L.) Willd. Sp. Pl. 4: 1083. 1806; Seem. Fl. Vit. 74. 1865; Greenwood in Proc. Linn. Soc. 154: 97. 1943; A. C. Sm. in Bull. Torrey Bot. Club 70: 540. 1943; Mune & Parham in Agr. J. Dept. Agr. Fiji 28: 24. fig. 1957, in Dept. Agr. Fiji Bull. 31: 30. fig. 7. 1957; Brennan in Fl. Trop. E. Afr. Leg. Mimos. 111. fig. 16 (38). 1959; J. W. Parham in Dept. Agr. Fiji Bull. 35: 87. fig. 44. 1959, Pl. Fiji Isl. 68. 1964, ed. 2. 103. 1972; Mune & Parham in Dept. Agr. Fiji Bull. 48: 14. fig. 2. 1967; Pedley in Austrobaileya 1: 308. 1979; Verdcourt, Man. New Guinea Leg. 168. 1979.

Mimosa farnesiana L. Sp. Pl. 521. 1753.

Vachellia farnesiana Wight & Arn. Prodr. Fl. Ind. Orient. 272. 1834.

As it is seen in Fiji, *Acacia farnesiana* is a freely branched shrub or tree 1–6 m. high, naturalized near sea level along roadsides, in cultivated areas and pastures, and on beaches and dry river banks. The trunk and branches bear copious spines. The fragrant flowers have the corolla and stamens golden-yellow, and the fruits are dark brown to black, with chestnut-brown seeds. Flowers and fruits seem to occur throughout the year.

TIPIFICATION: Although this remains uncertain, the species is based primarily on L. Hort. Upsal. 146. 1748 (fide Brenan, 1959, cited above).

DISTRIBUTION: Tropical America, but now widely naturalized throughout the tropics. In Fiji it is known definitely only from Viti Levu.

LOCAL NAMES AND USES: Recorded Fijian names are *vaivai vakavotona* and *oki*; otherwise known as *Ellington curse* and *ban baburi* (Hindi). *Acacia farnesiana* is widely cultivated throughout the tropics for the pleasant fragrance of its flowers, often being known as *cassie*. Cassie perfume is obtained from the flowers, a small industry in making this perfume being centered in southern France. Other uses are detailed by Burkill (Dict. Econ. Prod. Malay Penins. ed. 2. 20–22. 1966). It had been introduced before 1860 into Fiji for its flowers, but Seemann preserved no specimen of it. Unfortunately the species readily escapes from cultivation and becomes a serious pest; it is a “declared noxious weed” in Fiji. Methods for its control are detailed by Mune and Parham (1957, 1967, cited above).

AVAILABLE COLLECTIONS: VITI LEVU: Mba: Lautoka, *Greenwood 33*; Nandi, *Greenwood 33A*; shores of Mba River near its mouth, *Smith 4728*; Namosau Government Station, Mba, *DA 18853*; Toko Tavua, *DA 9482*. RA: Rambululu, *DA 10444*; Ellington, *Parks 20856*, *DA 7896*, *10752*; Viti Levu Bay, *Vaughan 3436*. TAILEVU: Queen Victoria School, *DA 14528*. FIJI without further locality, *DA 9003*.

2. *Acacia curassavica* (Britton & Killip) Stehlé in Bull. Mus. Hist. Nat. (Paris) II. 18: 191. 1946; J. W. Parham, Pl. Fiji Isl. ed. 2. 102. 1972.

Acaciella curassavica Britton & Killip in J. Wash. Acad. Sci. 24: 47. 1934.

As cultivated in Fiji, *Acacia curassavica* is an unarmed shrub or small tree 1.5–6 m. high, growing near sea level. The corolla and filaments are white, and the fruits are brown, with 5–8 seeds 3–5 × 3 mm. The collections seen bore fruits in July, August, and November, and flowers in the same months as well as in April.

TIPIFICATION: The type of *Acaciella curassavica* is *Britton & Shafer 2943* (NY HOLOTYPE; ISOTYPE at US), collected March 20–27, 1913, near Willemstad, Curaçao.

DISTRIBUTION: Curaçao, Bonaire, and some of the Lesser Antilles as far north as Guadeloupe.

USE: The species was introduced into Fiji as a possible cocoa or coffee shade and is grown experimentally for that purpose; there is no indication that it has been put into practical use. One of the cited collections, *DA 10795*, bears the notation: “Brought into the Colony from Caracas or Curaçao in 1950 as FDA 13023.” One may assume that the introduction was from Curaçao, since the material seems identical with type material of the species.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Plant Introduction and Quarantine Station, Nanduruloulou, *DA 8486*; Mothimothi, Nanduruloulou, *DA 10795*; Nanduruloulou, *DA 11051*; Principal Agricultural Station, Koronivia, *DA 12134*.

Acacia curassavica is here retained in the sense of Stoffers (Fl. Netherlands Antilles 3: 20. 1973) as distinct from *A. glauca* (L.) Moench (including *A. villosa* (Sw.) Willd.) as interpreted by de Wit (in Taxon 10: 53. 1961; Shaw & Schubert in J. Arnold Arb. 57: 113. 1976), the latter species presumably having a distribution of Central America and Jamaica. To the contrary, Gooding et al. (Fl. Barbados, 185. 1965) and Adams (Fl. Pl.

Jamaica, 336. 1972) maintain *A. villosa* as a Jamaican endemic and assign the more easterly taxon to *A. glauca*, to which they would reduce *A. curassavica*. As the type specimen of *A. glauca* was described by de Wit, it clearly differs from *A. curassavica* in its broader fruits as well as in its pubescent branchlets and leaves. It would therefore seem that *A. curassavica* should not be synonymized with *A. glauca*, regardless of one's interpretation of the limits of *A. villosa*.

3. **Acacia polystachya** A. Cunn. ex Benth. in London J. Bot. **1**: 376. 1842; J. W. Parham, Pl. Fiji Isl. ed. 2. 104. 1972; Pedley in *Austrobaileya* **1**: 173. 1978.

As seen in Fiji, *Acacia polystachya* is sparingly cultivated near sea level as a tree about 11 m. high (up to 25 m. high where indigenous); its corolla and stamens are yellow. Flowers have been obtained in February and April, fruits only in April.

TIPIFICATION: The type is *Cunningham* (K LECTOTYPE designated by Pedley), collected in 1820 on Haggerstone Island (east coast of York Peninsula), Queensland, Australia. Bentham's original citation was "Endeavour River and Cape Flinders, North Coast."

DISTRIBUTION: Queensland, occurring from Cairns north to Banks Island in Torres Strait and the Palm Islands, and apparently sparingly cultivated elsewhere.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Koronivia Research Station, *DA 13565*. FIJI without further locality, *Wilder*, Feb. 20, 1935 (BISH).

4. **Acacia pendula** A. Cunn. ex G. Don, Gen. Hist. Dichlam. Pl. **2**: 404. 1832; B. E. V. Parham in Agr. J. Dept. Agr. Fiji **10**: 113. 1939; Pedley in *Austrobaileya* **1**: 197. 1978.

TIPIFICATION: The type is *Cunningham* (K LECTOTYPE; ISOLECTOTYPE at BM, fide Pedley, 1978), collected in 1817 along the Lachlan River, New South Wales, Australia.

DISTRIBUTION: Australia from central Queensland southward into New South Wales, and presumably cultivated elsewhere.

LOCAL NAMES AND USE: *Acacia pendula*, known as *myall* in Queensland and as *boree* in New South Wales, is an attractive tree up to 12 m. high where indigenous, with pendulous branches and silvery foliage; it would be a desirable ornamental if it could be established.

No vouchers from Fiji are available, but Parham (cited above) states that the species had been introduced into Fiji in 1921 and that in 1939 only one or two trees remained and were not doing well. It may not have survived in Fiji, but Parham's identification of this well-known Australian tree is probably correct.

5. **Acacia simplex** (Sparman) Pedley in Contr. Queensland Herb. **18**: 10. 1975.

FIGURE 17A & B.

Mimosa simplex Sparman in Nova Acta Soc. Sci. Upsal. **3**: 195. 1780.

Mimosa simplicifolia L. f. Suppl. Pl. 436, nom. illeg. 1782.

Mimosa mangium Forst. f. Fl. Ins. Austr. Prodr. **75**, nom. illeg. 1786.

Acacia laurifolia Willd. Sp. Pl. **4**: 1053, nom. illeg. 1806; Benth. in London J. Bot. **2**: 218. 1843; A. Gray, Bot. U. S. Expl. Exped. **1**: 482. 1854; Seem. in Bonplandia **9**: 255. 1861, Viti, 436. 1862, Fl. Vit. **73**. 1865; Drake, Ill. Fl. Ins. Mar. Pac. **160**. 1890.

Acacia simplicifolia Druce in Bot. Soc. Exch. Club Brit. Isles **4**: 602, nom. illeg. 1917; Guillaumin in J. Arnold Arb. **12**: 248. 1931; Christophersen in Bishop Mus. Bull. **128**: 98. 1935; Yuncker in op. cit. **220**: 129. 1959; J. W. Parham, Pl. Fiji Isl. **68**. 1964, ed. 2. 104, fig. **31**. 1972; St. John & A. C. Sm. in Pacific Sci. **25**: 327. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 124. 1972.

In Fiji *Acacia simplex* is an often spreading tree 3–12 m. high, with angular branchlets, frequently abundant along sandy beaches and on the inner edges of mangrove swamps; it is never found far from the sea. Its fragrant flowers have yellow

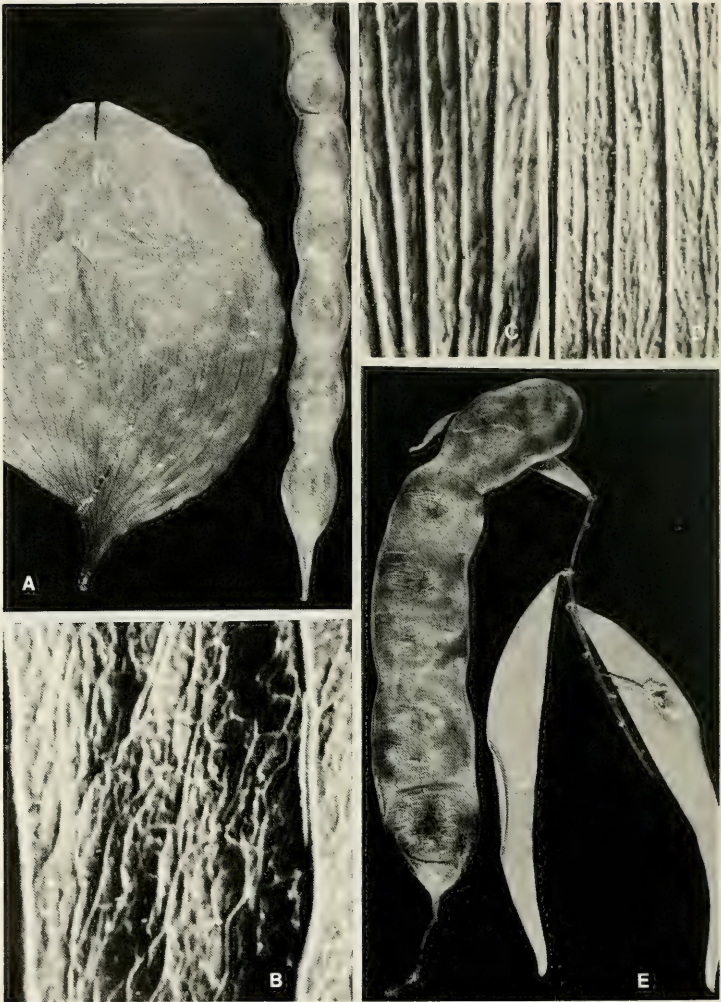


FIGURE 17. A & B, *Acacia simplex*; A, phyllode and fruit, $\times 1$; B, detail of phyllode surface, $\times 10$. C, *Acacia mathuataensis*; detail of phyllode surface, $\times 10$. D & E, *Acacia richii*; D, detail of phyllode surface, $\times 10$; E, phyllodes, mature inflorescence, and fruit, $\times 1$. A, phyllode from *Bryan 363*, fruit from *Bryan 287*, B from *Smith 1458*, C from *Smith 6521*, D from *DF 258*, E, phyllodes and inflorescence from *DF 258*, fruit from *Smith 4519*.

corollas and stamens; the fruit is brown, with longitudinally arranged seeds about 6.5×4.5 mm. Flowers and fruits have been obtained in months between December and August.

TYPEIFICATION: The type is *J. R. & G. Forster* (BM HOLOTYPE, fide Pedley, 1975), collected during the second Cook voyage on Tanna, New Hebrides. Pedley questions whether or not the P specimen is an isotype; since other Forster collections may exist elsewhere, I believe that the BM specimen is better designated the LECTOTYPE. The same type collection is involved for *Mimosa simplicifolia*, *M. mangium*, and *Acacia laurifolia*, all of which are therefore illegitimate names (ICBN, Art. 63.2).

DISTRIBUTION: New Caledonia and the New Hebrides eastward to Tonga and Samoa, and presumably sparingly introduced into the Santa Cruz Islands. About 30 Fijian collections are at hand, but the species is to be expected along most beaches.

LOCAL NAMES AND USES: This species, well known to Fijians, is usually called *tatangia* or *atangia*. Its hard wood is used for axe handles and other small carpentry items. The leaves (phyllodes), according to Seemann, were used as spoons (*ai taki*), and therefore Seemann thought the local name more accurately to be *tatakia*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Saweni Beach, *DA 13787*. NANDRONGA & NAVOSA: Thuvu, *Greenwood 275*. TAILEVU: Naingani Island, *DA 3327*. REWA: Nukulau Island, *Barclay 3441* (BM) or *s. n.* (K), *Hinds* (K). MBENGGGA: Ndakuni, *DA 2073*. OVALAU: *Tothill 132*. MOTURIKI: *Seemann 143*. VANUA LEVU: THAKAUNDROVE: Maravu, near Salt Lake, *Degener & Ordenez 14057*. RAMBI: *DA 4041*. TAVEUNI: Opposite Waitavala Estate, *DA 16901*. MATUKU: *Bryan 287*. TOTOYA: *Bryan 363*. YATHATA: Naveranavula, *DA 15549*. VANUA MBALAVU: Southern limestone section, *Smith 1458*. KATAFANGA: *DA 4039*. NAYAU: *Tothill 132c*. LAKEMBA: Near Tumbou Jetty, *Garnock-Jones 783*. KOMO: *Bryan 495*. FULANGA: On limestone formation, *Smith 1188*. FIJI without further locality, *U. S. Expl. Exped.*

6. *Acacia mathuataensis* A. C. Sm. in *J. Arnold Arb.* **31**: 165. 1950; J. W. Parham, *Pl. Fiji Isl.* **68**. 1964, ed. 2. 104. 1972; Pedley in *Contr. Queensland Herb.* **18**: 11. 1975.

FIGURES 17C, 18.

A spreading tree to 6 m. high, apparently rare in dense crest thickets at an elevation of 500–590 m. The corolla and stamens are bright yellow.

TYPEIFICATION: The type is *Smith 6521* (A HOLOTYPE; many ISOTYPES), collected in flower Nov. 6, 1947, on the summit ridge of Mt. Numbuiloa, east of Lambasa, Mathuata Province, Vanua Levu.

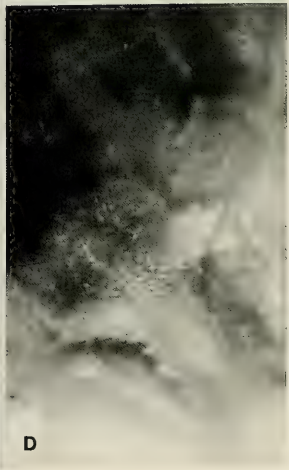
DISTRIBUTION: Known only from the type collection.

LOCAL NAME: *Tatangia*.

Although it is known only from a single collection, *Acacia mathuataensis* seems very distinct from its only relative in the area, *A. simplex*, in the shape, size, and nervation of its phyllodes and in characters of its inflorescences and calyx. It is accepted as a distinct species by Pedley, although he considers it closer to *A. simplex* than seems to be the case.

7. *Acacia richii* A. Gray, *Bot. U. S. Expl. Exped.* **1**: 482. 1854, *Atlas, pl. 53, B.* 1856; Seem. in *Bonplandia* **9**: 255, as *A. ritchei*. 1861, Viti, 436. 1862, *Fl. Vit.* **73**. 1865; Drake, *Ill. Fl. Ins. Mar. Pac.* **161**. 1890; J. W. Parham, *Pl. Fiji Isl.* **68**. 1964, ed. 2. 104. 1972; Pedley in *Contr. Queensland Herb.* **18**: 12. 1975. FIGURE 17D & E.

An often freely branched tree 6–25 m. high, occurring at elevations of 100–900 m. in dense forest or in forest patches in open country, in the forests of crests and ridges, and on open hillsides. The corolla and filaments are pale yellow. Flowers and fruits have been obtained between May and December.



LECTOTYPIFICATION: Gray cited Exploring Expedition material as "common in barrens, at Sandalwood Bay, Vanua-levu, and Nalao." The first locality is Mbua Bay, Mbua Province, Vanua Levu; the second, doubtless Ngaloa, may refer to Ngaloa Bay on Kandavu, certainly visited by the Expedition, although no subsequent material has been noted from Kandavu. A precise locality therefore cannot be indicated for *U. S. Expl. Exped.* (US 47662 LECTOTYPE); specimens at GH, K, and P are not necessarily isolectotypes. The specimen here indicated as lectotype is fairly complete; a second specimen at US (47663) is a sterile branch with comparatively small phyllodes.

DISTRIBUTION: Endemic to Fiji and known with certainty only from the two largest islands.

LOCAL NAMES AND USES: The usual Fijian name is *nggumu*, but also noted are *tumbonu*, *loaloo*, and *lolo* (the last certainly erroneous and probably to be transcribed *loaloo*). The hard wood is valued as timber; a black dye (also called *nggumu*, = paint) produced by the plant was in earlier times used for blackening the face on special occasions.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Upper Namosi Creek, near Tumbenasolo, *Greenwood 1193*; northern slopes of Mt. Namendre, east of Mt. Koromba, *Smith 4519*. NANDRONGA & NAVOSA: Vicinity of Mbalo, near Vatukarasa, *Degener 15239*. SERUA: Inland from Yarawa, *DF 1068 (S1559/3)*, *1069 (S1559/4)*, *1070 (S1559/5)*, *Berry 115*; inland from Ngaloa, *DF 1032 (S1559/2)*; Taunovo River, *DF 258 (Nasoqiri 13)*; Serua without further locality, *DA 5526*. NAITASIRE: Naivuthini, *DA 2332*. VITI LEVU without further locality, *Seemann s. n. (K)*, *Graeffe 19 (BM)*, *s. n. (K)*, *Horne s. n. (K)*. VANUA LEVU: MATHUATA: Small hill near Ndreketi River, *Mead 2009*; vicinity of Nanduri, *Tohill 452*; Seangangga Plateau, vicinity of Natua, *Smith 6901*, *DA 12847*; Naravuka, Ndreketi River, *DF 1030 (S1559/1)*; Tandrandave, *DA 12949*. THAKAUNDROVE: Eastern drainage of Yanawai River, *Degener & Ordonez 14078*. FIJI without further locality, *Seemann 144* (some sheets 145 err.), *Horne 1105 (K)*, *s. n. (GH)*.

This very sharply characterized Fijian endemic seems distantly related only to the Australian *Acacia excelsa* Benth. and to *A. confusa* Merr., of Taiwan and the Philippines.

8. *Acacia* sp. Greenwood in J. Arnold Arb. 30: 76. 1949.

AVAILABLE COLLECTION: VITI LEVU: MBA: Near Varoka, vicinity of Mba, *Greenwood 1182*.

Of this unidentified specimen of subgenus *Acacia* Greenwood wrote: "This is apparently a recent arrival in the Colony and, as far as I know, occurs only at this one locality, where efforts are being made to eradicate it before it spreads. It grows to 12 feet high and is armed with strong spines."

9. *Acacia* sp.

AVAILABLE COLLECTION: VANUA LEVU: MATHUATA: Seangangga Agricultural Station, in cocoa plantation, *DA 12283*.

I am unable to place this sterile material of subgenus *Heterophyllum*, from a tree 6–8 m. high recorded as *tatanggia*, which represents neither *Acacia polystachya* nor *A. pendula*. It was perhaps being experimentally grown as a possible cocoa shade.

10. ALBIZIA Durazz. in Mag. Tosc. 3 (4): 11. 1772; Brenan in Fl. Trop. E. Afr. Leg. Mimos. 136. 1959; Hutchinson, Gen. Fl. Pl. 1: 294. 1964; Verdcourt, Man. New Guinea Leg. 176. 1979.

FIGURE 18. *Acacia mathuataensis*, from *Smith 6521*; A, distal portions of branchlets, with foliage and inflorescences, $\times 1/2$; B, flowering head before anthesis, $\times 15$; C, flower, showing calyx, corolla, and exerted stamens (most anthers fallen) and style, $\times 30$; D, flower-subtending bracteole, $\times 70$.

Albizzia Durazz. ex Benth. in London J. Bot. 3: 84. 1844. Orth. var.

Pithecolobium sect. *Samanea* Benth. in London J. Bot. 3: 197. 1844.

Samanea Merr. in J. Wash. Acad. Sci. 6: 46. 1916; Hutchinson, Gen. Fl. Pl. 1: 294. 1964; Verdcourt, Man. New Guinea Leg. 206. 1979.

Armed or unarmed trees and shrubs, rarely lianas (none of ours), the stipules setaceous or lanceolate, rarely larger and membranaceous, caducous; leaves bipinnate, with glands on petioles and rachises, the leaflets (1-) few or many pairs, opposite; inflorescences capitate or spicate, pedunculiform, solitary or subfasciculate or corymbose, axillary or the distal ones paniculiform; flowers often 5-merous (infrequently 4-7-merous), ♂ or ♂ and ♀, those of the same part-inflorescence heteromorphic or uniform; calyx dentate or short-lobed; corolla infundibular or campanulate, the lobes often connate to middle or beyond; stamens numerous (usually 19-50), usually long-exserted, the filaments proximally connate into a slender tube, the anthers small, eglandular; ovary sessile, the ovules numerous; fruits oblong, straight or slightly curved, flattened, dehiscent or not, segmented or not, the valves thin to thick and subliguous, neither elastic nor twisted, sometimes contracted between basal seeds, the seeds ovoid or orbicular, uniserially arranged, transverse, compressed, without an aril, the testa thick.

TYPE SPECIES AND NOMENCLATURE: *Albizzia* is typified by *A. julibrissin* Durazz., *Samanea* by *S. saman* (Jacq.) Merr. (*Mimosa saman* Jacq.). *Albizzia* is here construed in the comprehensive sense utilized by Nielsen (in Adv. Leg. Syst. 180. 1981), with some regret in that it means giving up the well-known and euphonious name *Samanea saman* for the beautiful *rain tree*. The spelling *Albizzia* is often used, but Durazzini's latinization of Albizzi's name was intentional and must be preserved (ICBN, Art. 73.7); in the citations under species below the two spellings have not been differentiated.

DISTRIBUTION: Tropics and subtropics, with about 150 species, many of which are cultivated as ornamentals and timber trees. Five species occur in Fiji, all of them introduced in cultivation and to a certain extent naturalized.

KEY TO SPECIES

- Fruits dehiscent along both sutures (at least tardily so), thin, flat (or swollen over seeds), without pulp, not septate, the valves satiny white within; calyx not more than 5 mm. long; corolla not more than 9 mm. long, white to greenish yellow; filaments white to pale green or pale yellow.
- Flowers in spikes 1-2.5 cm. long; calyx 1-2.5 mm. long; corolla 3-7 mm. long; filaments 10-17 mm. long; fruits 9-12 cm. long, 1.2-2.5 cm. broad, with a narrow wing along ventral suture; leaf rachis and petiole ferruginous-tomentellous or -puberulent, the leaves with (4-) 8-20 pairs of pinnae, the leaflets in (10-) 15-26 pairs, small, usually 8-15 × 3-6 mm. 1. *A. falcataria*
- Flowers in heads; leaf rachis and petiole glabrous or sparsely pilose, the pinnae not more than 8 pairs, the leaflets not more than 12 pairs and at least 15 × 6 mm.
- Leaves with 1 or 2 pairs of pinnae, the leaflets in 2-4 pairs, comparatively large, (2-) 5-15 × (1-) 3.5-7.5 cm.; flowers comparatively small, the calyx about 1.7 mm. long, the corolla 5-6 mm. long, the filaments about 15 mm. long; fruits 7-18 cm. long, 2.5-3 cm. broad. 2. *A. saponaria*
- Leaves with more numerous pinnae (only rarely 1 or 2 pairs), the leaflets seldom as few as 3 pairs, usually smaller than 6 × 3 cm.; flowers comparatively large.
- Fruits (12-) 15-33 cm. long, 2.5-6.5 cm. broad; calyx 2-5 mm. long; corolla 5-9 mm. long; filaments 15-30 (-45) mm. long; leaves with (1-) 2-4 (-5) pairs of pinnae, the leaflets in 3-11 pairs, 1.5-5.5 (-6.5) × (0.6-) 1-2.5 (-3.3) cm. 3. *A. lebbbeck*
- Fruits 10-25 cm. long, (1.5-) 2-2.5 cm. broad; calyx 1.5-2.5 mm. long; corolla 3.5-7 mm. long; filaments 10-13 mm. long; leaves with (2-) 3-5 (-8) pairs of pinnae, the leaflets in 6-12 pairs, 2-6 × 0.7-3.3 cm. 4. *A. procera*
- Fruits indehiscent, 9-20 cm. long, 1.3-2.2 cm. broad, thick (4-15 mm.), semisucculent, internally septate, with thickened sutures; flowers in heads, the central flower larger than the others; calyx 6-7.5 mm. long; corolla up to 13 mm. long, pink with greenish or yellowish lobes; filaments 20-35 mm. long, white proximally, shading to pink or crimson distally; leaves with 3-9 pairs of pinnae, the leaflets in 2-10 pairs, (1-) 2-6 × (0.5-) 1-4 cm., the distal ones larger than the proximal ones. 5. *A. saman*

1. *Albizia falcataria* (L.) Fosberg in Reinwardtia 7: 88. 1965; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 121. 1970; J. W. Parham, Pl. Fiji Isl. ed. 2. 104. 1972; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 121. 1972; Verdcourt, Man. New Guinea Leg. 182. fig. 48. 1979.

Adenanthera falcataria L. Sp. Pl. ed. 2. 550. 1762.

Albizia falcata sensu Backer, Voorl. Schoolfl. Java, 109, typo excl. 1908; J. S. Sm. in Agr. J. Dept. Agr. Fiji 12: 67. 1941; W. L. Parham in loc. cit.; J. W. Parham, Pl. Fiji Isl. 68. 1964; non sensu *Adenanthera falcata* L. (1754).

As seen in Fiji, *Albizia falcataria* is a tree 12–18 m. high (up to 40 m. where indigenous), cultivated and perhaps sparingly naturalized from near sea level to an elevation of 250 m. The corolla is cream-colored or greenish yellow, and the filaments are whitish. However, the available Fijian collections are in fruit only, obtained in January, March, and September.

TYPIIFICATION AND NOMENCLATURE: *Adenanthera falcataria* is based entirely on *Clypearia alba* Rumph. Herb. Amb. 3: 176. t. 111. 1743. Fosberg in 1965 clarified the nomenclature, indicating that *Adenanthera falcata* L. was based on Rumphius's t. 112, *Clypearia rubra*, and that the epithet *falcata* could not be utilized for the present species. This had been widely known as *Albizia moluccana* Miq. (1855), the synonymy of which with *A. falcataria* is very doubtful (cf. Verdcourt, 1979, cited above).

DISTRIBUTION: Moluccas, New Guinea, New Britain, and the Solomon Islands, widely planted elsewhere (as in Hawaii) for reforestation, often under the name *Albizia moluccana*.

USE: A timber tree and shade tree; in Fiji it is not widely used, although it may be occasionally naturalized in lowland forest. It was apparently introduced in 1937 as a potential source of firewood, as it is very fast-growing, although susceptible to wind damage.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Department of Forestry plantation, Tholo-i-suva, DA L.14329; Tholo-i-suva, DF 373, Damanu 60; Principal Agricultural Station, Koronivia, DA 12352. TAVEUNI: Waitavala Estate, DA L.14328.

2. *Albizia saponaria* (Lour.) Bl. ex Miq. Fl. Ned. Ind. 1 (1): 19. 1855; J. W. Parham, Pl. Fiji Isl. 69. 1964, ed. 2. 106. 1972; Verdcourt, Man. New Guinea Leg. 191. 1979.

Mimosa saponaria Lour. Fl. Cochinch. 653. 1790.

In Fiji *Albizia saponaria* is sparsely cultivated and also locally naturalized at low elevations along roadsides and forming thickets. It is seen as a tree 5–12 m. high, with a white corolla and filaments. Flowers have been noted in months scattered throughout the year.

TYPIIFICATION: Loureiro cited merely: "Habitat in sylvis Cochinchinae."

DISTRIBUTION: Indo-China to the Philippines, Borneo, the Moluccas, and the Key Islands, but often cultivated and sometimes naturalized elsewhere.

USES: The wood is whitish and not very durable; saponin is present in parts of the plant, and the bark and wood produce a lather when rubbed in water.

AVAILABLE COLLECTIONS: VITI LEVU: TAVEUNI: Namalata, cultivated, DA, Jan. 29, 1938; Korovou, DA, March 30, 1938, 2291, 15561; opposite Sach's farm, DA 7673; Tavelevu without further locality, DA 1001.

The species apparently does not naturalize very readily, since it is known only from Tavelevu Province; it may have first been cultivated at an agricultural compound in Korovou, presumably in the 1930's.

3. *Albizia lebbek* (L.) Benth. in London J. Bot. 3: 87, as *Albizzia lebbek*. 1844; A. C. Sm. in Bull. Torrey Bot. Club 70: 540. 1943; Greenwood in Proc. Linn. Soc. 154: 98. 1943; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 89. 1948; Greenwood in J. Arnold Arb. 30: 76. 1949; Brenan in Fl. Trop. E. Afr. Leg. Mimos. 147. 1959; Yuncker in Bishop Mus. Bull. 220: 129. 1959; J. W. Parham in Dept. Agr. Fiji Bull. 35: 89. 1959, Pl. Fiji Isl. 68. 1964, ed. 2. 104. 1972; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 121. 1972; Verdcourt, Man. New Guinea Leg. 185. fig. 49. 1979.

Mimosa lebbek L. Sp. Pl. 516. 1753.

In Fiji *Albizia lebbek* is noted as an often spreading tree 5–20 m. high, cultivated or naturalized along roadsides or in patches of forest at elevations from near sea level to about 200 m. Its calyx and corolla are greenish yellow, its filaments white to yellow proximally and pale green distally, and its fruits green to stramineous. Flower have been obtained in November and December, fruits between June and December.

TYPIFICATION: The type is Herb. Linnaeus 1228.16 (LINN SYNTYPE), fide Brenan in 1959, cited above. Linnaeus's original citation was: "*Hasselquist, act. ups. 1750. p. 9*", "*Habitat in Aegypto superiore.*"

DISTRIBUTION: Probably indigenous in tropical Asia (rather than Egypt), but now widespread in tropical areas. Available material suggests that its introduction into Fiji was probably not much earlier than 1920.

LOCAL NAMES AND USES: *Vaivai* or *vaivai ni valangi* (one report of *vaivai ni Viti* is questionable); also *siris* (a Malesian name), *siris rain tree*, or simply *rain tree*. The timber seasons and polishes well and is fairly durable, useful for furniture and veneering as well as for general construction.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Tavakumbu Block, Lautoka, DA 16335 (DF 1283); between Mba and Tavua, Greenwood 791. SERUA: Navutulevu, DA 9281. NAITASIRE: Nanduruloulou, DA 721. TAILEVU: Natovi, DA 11275. REWA: Between Suva and Lami, Gillespie 2064; Suva Bay, Bryan 197. VANUA LEVU: MATHUATA: Tambia, Sasa Tikina, Berry 59; Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, Smith 6874. TAVEUNI: Vicinity of Waiyevo, Smith 8123. VANUA MBALAVU: Site of Lomaloma Botanical Gardens, Tohill 576, DA 10201. LAKEMBA: Near Tumbou, Garnock-Jones 892.

Although the specific epithet was doubtless derived from a vernacular name *lebbek*, Linnaeus's spelling *lebbek* must be retained; the two spellings are not differentiated above except for Bentham's usage.

4. *Albizia procera* (Roxb.) Benth. in London J. Bot. 3: 89. 1844; Greenwood in J. Arnold Arb. 25: 399. 1944; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 89. fig. 1. 1948, in op. cit. 29: 31. 1959, Pl. Fiji Isl. 68. 1964, ed. 2. 105. 1972; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 121. 1972; Verdcourt, Man. New Guinea Leg. 187. fig. 50. 1979.

Mimosa procera Roxb. Pl. Coromandel 2: 12. t. 121. 1799.

In Fiji *Albizia procera* is cultivated and often naturalized between sea level and about 200 m. elevation as a tree 7–10 m. high (up to 30 m. where indigenous). Its flowers have a white to greenish white corolla and pale yellow or white filaments, and the fruit is red-brown. Dated specimens bore flowers in March, fruits between December and July.

TYPIFICATION: The type locality was mentioned by Roxburgh as the Coromandel coast of India.

DISTRIBUTION: India to Malesia and Australia, cultivated and naturalized elsewhere. The material at hand would suggest its introduction into Fiji as the 1920's or 1930's.

LOCAL NAMES AND USES: The usual Fijian names are *vaivai* or *vaivai ni vavalangi*; it is known as *silver bark rain tree* and (perhaps inaccurately) *monkeypod*. In addition to being ornamental, the tree produces a wood useful for furniture and general construction.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Lautoka and vicinity, *Greenwood 794, St. John 18174, DA 971, DF 1045 (Damanu 181)*. REWA: Botanical Gardens, Suva, *Tothill 137, DA 1005, 12166, 12359*. VANUA LEVU: MATHUATA: Lambasa, *DA 1490*.

5. *Albizia saman* (Jacq.) F. v. Muell. Select. Pl. ed. 2. 12. 1876.

Mimosa saman Jacq. Fragm. Bot. 15. pl. 9. 1801.

Pithecolobium saman Benth. in London J. Bot. 3: 216. 1844.

Samanea saman Merr. in J. Wash. Acad. Sci. 6: 47. 1916; A. C. Sm. in Bull. Torrey Bot. Club 70: 540. 1943; Greenwood in Proc. Linn. Soc. 154: 97. 1943; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 122. 1970; J. W. Parham, Pl. Fiji Isl. ed. 2. 107. 1972; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 71. 1972; Verdcourt, Man. New Guinea Leg. 207. fig. 55. 1979.

Pithecolobium saman Benth. ex J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 91. 1948, in op. cit. 29: 33. 1959, Pl. Fiji Isl. 70. 1964.

A tree 7–25 m. high, with a trunk up to 1 m. in diameter and with a spreading, rounded crown, found from near sea level to an elevation of 700 m., cultivated and sometimes abundantly naturalized along roadsides, on river banks, and in forests. The calyx is green, the corolla pink with greenish or yellowish lobes, and the filaments are white proximally, shading to pink or crimson distally. The mature fruits become black, with brown seeds. In general, flowers are found between November and May, fruits between July and December.

TYPIFICATION: The species was presumably illustrated and described from a Jacquin collection from Caracas, Venezuela.

DISTRIBUTION: Indigenous in tropical America from Mexico to Peru and Brazil, now cultivated throughout the tropics. It may have been first introduced into Fiji by J. B. Thurston, being listed in his *Catalogue* (cf. Vol. 1 of this *Flora*, pp. 47, 87).

LOCAL NAMES AND USES: Like many other introduced trees of the family, *Albizia saman* is called *vaivai ni vavalangi*; the usual English name is *rain tree*, and *sirsa* (not Fijian) has also been recorded. *Monkeypod* is often used for this species but perhaps more accurately should refer to related genera with twisted fruits, such as *Pithecolobium*. As an ornamental tree, *A. saman* is now to be found everywhere in the wet tropics as a street or garden tree, prized for its broad, symmetrical, dome-shaped crown and its rapid growth. The wood is used for manufacture of bowls, trays, and ornaments and some is exported for these purposes. The pods, which have a honeylike fragrance when broken, provide a cattle feed.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Nandi, *DA 9762; Ndrasa, DA 16325 (DF 1280)*; along road between Waikumbukumbu and Nandarivatu, *Gillespie 4378*. SERUA: Yarawa, *DF 1066 (S1558/3), 1067 (S1558/4)*. RA: Yanggara, *Greenwood 792*. NAITASIRE: Waimanu River, *Berry 55*. REWA: Botanical Gardens, Suva, *DA 1318; Edinburgh Drive, Suva, DA 15878*. VANUA LEVU: MATHUATA: Ndreketi, *DA 12957*; vicinity of Vunisea Village, *Berry 29; Lambasa, DF 1025 (S1558/1), 1026 (S1558/2)*. TAVEUNI: Vicinity of Waiyevo, *Smith 8251*. KANATHEA: *Bryan 574*.

11. *ENTEROLOBIUM* Mart. in *Flora* 20 (2) (Beibl. 8): 117. 1837; Hutchinson, Gen. Fl. Pl. 1: 294. 1964; Verdcourt, Man. New Guinea Leg. 204. 1979.

Unarmed trees, the stipules inconspicuous; leaves bipinnate, sometimes with glands on petiole and rachis, the leaflets opposite in numerous pairs; inflorescences axillary or subterminal, pedunculate, solitary or subfasciculate or in short racemiform groups, composed of small, globose heads; flowers 5-merous, usually ♂ and slightly heteromorphic, subsessile, those of the same inflorescence-part uniform; calyx short-dentate; corolla infundibular, divided about to middle; stamens numerous, the filaments proximally connate into a tube, the anthers small; ovary sessile, the ovules

many; fruits twisted in a flat plane into a circle or curved-reniform, thick and compressed, indehiscent, at length woody, the mesocarp spongy, the endocarp forming septa between seeds, the seeds biserially arranged, transverse, compressed-ellipsoid, without an aril, the pleurogram often pale.

LECTOTYPE SPECIES: *Enterolobium contortisiliqua* (Vell.) Morong (*Mimosa contorti-siliqua* Vell.) (vide Britton & Killip in Ann. New York Acad. Sci. 35: 124. 1936).

DISTRIBUTION: West Indies and Central America to Argentina, with 5-10 species, two of which are widely cultivated elsewhere. One species is sparingly cultivated in Fiji.

Enterolobium is scarcely to be distinguished from some groups of *Albizia* but is retained because of its greatly curved or curled fruits with biserially arranged seeds (Nielsen in Adv. Leg. Syst. 182. 1981).

1. *Enterolobium cyclocarpum* (Jacq.) Griseb. Fl. Brit. W. Ind. 226. 1860; J. W. Parham, Pl. Fiji Isl. ed. 2. 106. 1972; Verdcourt, Man. New Guinea Leg. 206. 1979.

Mimosa cyclocarpa Jacq. Fragm. Bot. 30. t. 34, fig. 1. 1801.

A wide-canopied tree, where indigenous up to 38 m. high and with a massive trunk to 3 m. in diameter, infrequently cultivated in Fiji near sea level. The leaves have 4-9 pairs of pinnae, each with 13-30 pairs of leaflets 8-13 × 2-4 mm. The corolla and filaments are white to greenish, the very characteristic fruit brown to blackish and curved into a circle or spiral often 10-13 cm. in diameter, with dark brown seeds. Although the species may be occasionally seen in Fiji, the only voucher was in flower and fruit in November.

TYPIFICATION: Only a fruiting specimen from Caracas, Venezuela, was known to Jacquin.

DISTRIBUTION: Central and northern South America, now widely cultivated throughout the tropics.

LOCAL NAMES AND USES: The usually applied names are *elephant's ear* or *earpod*. As cultivated, the species is a highly ornamental shade tree; where native it is used as a timber tree, and its fruits may be used as a cattle feed.

AVAILABLE COLLECTION: VITI LEVU: TAILEVU: Fijian School near Korovou, DA 16016.

12. *Calliandra* Benth. in J. Bot. (Hooker) 2: 138. 1840; Hutchinson, Gen. Fl. Pl. 1: 297. 1964; Verdcourt, Man. New Guinea Leg. 173. 1979. Nom. cons.

Usually unarmed shrubs or small trees, the stipules often persistent, membranaceous, foliaceous, or rarely spinescent; leaves bipinnate, usually without glands, the leaflets opposite in 1-several pairs; inflorescences capitate, axillary, pedunculate, solitary or paired or aggregated in terminal racemes; flowers 5- or 6-merous, uniform or heteromorphic; calyx campanulate, shallowly or rarely deeply lobed; corolla infundibular, with lobes free above middle; stamens numerous (up to 100), long-exserted, the filaments proximally connate into a tube, the anthers usually glandular-pilose; ovary sessile, the ovules numerous; fruits linear, oblong or oblanceolate, straight or nearly so, often narrowed to base, compressed, thick-margined, 2-valved, the valves membranaceous to subligneous, elastically opening from apex, not segmented, the seeds obovoid to orbicular, uniserially arranged, without an aril, with a hard testa with pleurogram.

TYPE SPECIES: *Calliandra houstonii* ("houstonii") (L'Hér.) Benth., nom. illeg. (*Mimosa houstoni* L'Hér., nom. illeg.) = *Calliandra inermis* (L.) Druce (*Gleditsia inermis* L.).

DISTRIBUTION: Tropical and subtropical areas, with about 200 species, one of which is sparingly cultivated in Fiji.

1. *Calliandra surinamensis* Benth. in London J. Bot. 3: 105. 1844; Verdcourt, Man. New Guinea Leg. 176. fig. 47. 1979.

Calliandra portoricensis sensu J. W. Parham, Pl. Fiji Isl. ed. 2. 106. 1972; non Benth.

Calliandra surinamensis is sparingly cultivated in Fiji as a spreading shrub or small tree about 2 m. high (up to 6 m. elsewhere) near sea level. It has leaves with short petioles 6–15 mm. long and 1 (infrequently 2 or 3) pair of pinnae, these 3–7 cm. long and with 7–10 pairs of leaflets 10–17 × 3–5 mm. The flowers are sessile in showy heads, the calyx and corolla are green to yellowish, the filament tube is white, and the free parts of filaments are red to crimson. The fruits are oblong from a narrow base, thick-margined, 7–10.5 cm. long, and 8–13 mm. broad. The single available collection bore flowers and fruits in July.

TYPEFICTION: The type is *Hostmann 171* (K presumable HOLOTYPE), collected in Surinam without further locality.

DISTRIBUTION: Northern South America, now sometimes cultivated elsewhere as in the West Indies and, in the Pacific, at least in Hawaii and New Guinea.

USE: Introduced as an ornamental, the species may not have persisted in Fiji. The cited collection was obtained by S. Pillay on July 6, 1960.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Plant Introduction and Quarantine Station, Nanduruloulu, DA 12159.

13. *Pithecellobium* Mart. in Flora 20 (2) (Beibl. 8): 114, as *Pithecolobium*. 1837; Brenan in Fl. Trop. E. Afr. Leg. Mimos. 165. 1959; Hutchinson, Gen. Fl. Pl. 1: 296, p. p. 1964; Verdcourt, Man. New Guinea Leg. 209. 1979. Nom. et orth. cons.

Pithecolobium Benth. in London J. Bot. 3: 195. 1844. Orth. var.

Armed trees and shrubs, the stipules spinescent; leaves bipinnate, usually with glands on petiole and rachis, the leaflets opposite, sessile in 1–many pairs; inflorescences capitate or spicate, pedunculate, axillary and subfasciculate or racemiform or paniculiform; flowers 4–6-merous, ♂, uniform; calyx campanulate, short-dentate; corolla infundibular, lobed above middle; stamens few–numerous, long-exserted, the filaments proximally united into a tube, the anthers minute, versatile, eglandular; ovary sessile or stipitate, flattened, the ovules numerous; fruits circinnate, spirally twisted, or curved, 2-valved, the valves often twisted, chartaceous, reddish within, not segmented, the seeds ovoid or orbicular, compressed, arillate.

TYPE SPECIES: *Pithecellobium unguis-cati* ("Pithecolobium") (L.) Benth. (*Mimosa unguis-cati* L.). Typ. cons.

DISTRIBUTION: Tropical and subtropical America, with about 20 species, one of which is widely cultivated and naturalized throughout the tropics, as in Fiji.

1. *Pithecellobium dulce* (Roxb.) Benth. in London J. Bot. 3: 199. 1844; Greenwood in Proc. Linn. Soc. 154: 97. 1943; Brenan in Fl. Trop. E. Afr. Leg. Mimos. 165. 1959; J. W. Parham, Pl. Fiji Isl. 70. 1964, ed. 2. 107. 1972; Verdcourt, Man. New Guinea Leg. 209. fig. 56. 1979.

Mimosa dulcis Roxb. Pl. Coromandel 1: 67. t. 99. 1798.

As noted in Fiji, *Pithecellobium dulce* is a tree or shrub 2–15 m. high, with stipular thorns, cultivated in fairly dry areas near sea level and also naturalized in the dry zone along roadsides, etc. Its petioles are variable in length, 3–50 mm. long, with a gland between the single pair of pinnae, each of which bears a single pair of leaflets, these also being diverse in size, 7–50 × 3–23 mm. The flowers, in small heads, have greenish white to yellow corollas and filaments. The fruits become spirally twisted and produce seeds that are black and glossy, with a white to reddish aril. Dated Fijian collections bore flowers in May and August.

TYPEIFICATION: The type is *Roxburgh in Wallich 5282D* (HOLOTYPE probably at K, with a painting of type material, no. 488, fide Brenan, 1959), collected from a plant cultivated in Coromandel, India.

DISTRIBUTION: Tropical America from Mexico to Venezuela, but now widely cultivated and naturalized throughout the tropics.

LOCAL NAMES AND USES: The usual name, *Madras thorn*, is utilized in Fiji, and also recorded is *kataiya* (Hindi). The species was probably introduced into Fiji as an ornamental comparatively recently (early in the present century?); it is a good street tree for dry areas and when pruned is often used in hedges. The timber is heavy and durable, although soft, and can be used for general construction. Livestock eat the fruits, from the seed pulp of which a lemonadelike drink can be prepared.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Near Mba sugar mill, *DA 11469*; vicinity of Mba, *DA 16498*; Mba without further locality, *DA 462*. RA: Yanggara, *Greenwood 745A*; Rakiraki and vicinity, *DA 3292, 14361*; Ellington, *Greenwood 745*. VANUA LEVU: MATHUATA: Lambasa, *DA 328*.

14. *Serianthes* Benth. in London J. Bot. 3: 225. 1844; Fosberg in Reinwardtia 5: 294. 1960; Hutchinson, Gen. Fl. Pl. 1: 294. 1964; Verdcourt, Man. New Guinea Leg. 196. 1979.

Unarmed trees or shrubs, the branchlets with crowded leaf scars and often pubescent, the stipules obsolete; leaves bipinnate, large, usually with raised glands on petiole and rachis, the pinnae usually numerous, the leaflets alternate, numerous; inflorescences axillary and spicate or subterminal and paniculate and composed of few-flowered heads or racemes; flowers 5-merous, subsessile, ♂; calyx campanulate to infundibular, short-lobed; corolla infundibular, lobed at least to middle; stamens numerous (often as many as 500), long-exserted, the filaments proximally connate into a tube adnate at base to corolla tube, the anthers minute; ovary sessile, the ovules numerous; fruits narrowly oblong, straight, often densely tomentose, woody, thick-margined, indehiscent or tardily dehiscent, septate or not between seeds, the seeds oblong or ellipsoid, compressed, hard, glossy, transversely arranged, without an aril.

TYPE SPECIES: *Serianthes grandiflora* Benth., nom. illeg. = *S. myriadenia* (Bert. ex Guillemin) Planch. ex Benth. (*Acacia myriadenia* Bert. ex Guillemin); vide Fosberg in Taxon 12: 34. 1963.

DISTRIBUTION: Southeastern Asia through Malasia to New Caledonia and eastward in the Pacific to the Marquesas, Society, and Austral Islands, with about ten species. Two species are indigenous in Fiji, one of them endemic.

USEFUL TREATMENTS OF GENUS: FOSBERG, F. R. *Serianthes* Benth. (Leguminosae-Mimosoideae-Ingaeae). Reinwardtia 5: 293-317. 1960. KANIS, A. The Malasian species of *Serianthes* Benth. (Fabaceae-Mimosoideae). Brunonia 2: 289-320. 1980.

KEY TO SPECIES

- Fruits 8-12 cm. long (in our varieties), 3-4.5 cm. broad, ferruginous-tomentellous, slightly thickened at margin, the valves comparatively thick, with numerous, subimmersed veins; leaves usually with raised glands on petiole and rachis, the pinnae 4-12 pairs, the leaflets 8-26 pairs, 6-20 mm. long, 2-6 mm. broad, subsericeous on both surfaces but eventually subglabrate. 1. *S. melanesica*
- Fruits 12-15 cm. long, 5-5.5 cm. broad, closely tomentellous, scarcely thickened at margin, the valves relatively thin, with about 6 prominent, branching veins issuing from dorsal margin; leaves without glands on petiole and rachis, the pinnae 6-8 pairs, the leaflets 8-17 pairs, 10-15 mm. long, 5.5-7 mm. broad, glabrous or essentially so. 2. *S. vitiensis*

1. *Serianthes melanesica* Fosberg in Reinwardtia 5: 312. 1960.

DISTRIBUTION: As described and understood by Fosberg the species was composed of six varieties distributed from the New Hebrides and Loyalty Islands eastward to Tonga and Samoa. Subsequently Kanis (in Brunonia 2: 290. 1980) mentioned collec-

tions from the Santa Cruz Islands without assigning them to a variety. Three of the varieties were considered by Fosberg to be endemic to Fiji. The species is indicated to be closely related to *Serianthes myriadenia* (Marquesas, Society, and Austral Islands), *S. sachetae* (New Caledonia and Loyalty Islands), and *S. ebudarum* (New Hebrides), the two latter described as new by Fosberg in 1960.

Fosberg expressed dissatisfaction with his concepts of the four species of the Pacific complex and with their component varieties. However, *Serianthes melanesica* is here taken as circumscribed by him, and the varieties said to occur in Fiji are here discussed. The problem of taxa with overlapping ranges in the New Hebrides and Loyalty Islands casts some doubt on the reliability of their circumscriptions. The size and proportions of the calyx do not seem to merit the dependence on them expressed by Fosberg, and the size and degree of indument of leaflets are very variable. Perhaps *S. sachetae* is adequately separated from the complex by its very broad fruits; *S. myriadenia* appears to differ from *S. melanesica* and *S. ebudarum* in its larger corolla.

KEY TO VARIETIES

- Petiole (from base to first pinnae) 3–7 cm. long, the leaf rachis 8–15 cm. long, the leaflets 7–20 × 2.5–6 mm.
 1a. var. *melanesica*
 Petiole (from base to first pinnae) 8–10 cm. long, the leaf rachis 25–30 cm. long, the leaflets 6–14 × 2–4.5 mm.
 1b. var. *meeboldii*

1a. *Serianthes melanesica* var. *melanesica*; Fosberg in Reinwardtia 5: 312. 1960; J. W. Parham, Pl. Fiji Isl. ed. 2. 108. 1972. FIGURE 19.

Serianthes myriadenia sensu A. Gray, Bot. U. S. Expl. Exped. 1: 485, p. 1854; Seem. Viti, 436. 1862. Fl. Vit. 74. t. 14. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 161. 1890; J. W. Parham, Pl. Fiji Isl. 70. fig. 30. 1964; non Planch. ex Benth.

Serianthes vitiensis sensu Seem. in Bonplandia 9: 255. 1861, in op. cit. 10: 296. 1862, Viti, 436. 1862; non A. Gray.

Serianthes melanesica var. *macdanielsii* Fosberg in Reinwardtia 5: 313. 1960; J. W. Parham, Pl. Fiji Isl. ed. 2. 108. 1972.

An often spreading tree 4–21 m. high, occurring from near sea level to an elevation of about 750 m. in dense forest or on forested slopes, sometimes found along rocky shores and on the edges of mangrove swamps. The corolla is cream-white to pale yellow; the stamens have the filaments distally pink to crimson, paler proximally, and yellow anthers; and the fruit becomes velvety russet-brown at maturity. Flowers have been obtained between February and July, fruits between March and September.

TYPIFICATION AND NOMENCLATURE: The type variety of *Serianthes melanesica* is based on *Degener 15041* (NY HOLOTYPE; ISOTYPES at A, BISH, K, US), collected April 20, 1941, at Mbulu, near Sovi Bay, Nandronga & Navosa Province, Viti Levu. The type of var. *macdanielsii* is *MacDaniels 1067* (BISH HOLOTYPE; ISOTYPE at A), dated March 31, 1927, and obtained about five miles west of Suva (i. e. vicinity of Lami), Rewa Province, Viti Levu. The type number of var. *macdanielsii* is not at K, but it is interesting to find there "*Tothill 133* (coll. *MacDaniels*, April, 1927)", which Fosberg cited as var. *melanesica*. *Tothill 133* (K), from Lami, is almost certainly from the type plant of var. *macdanielsii* and may indeed be part of *MacDaniels 1067*. The Tothills often accompanied MacDaniels in 1927 and their different numbers were often taken from the same plant at the same time (cf. this *Flora*, vol. 1, p. 57). That Fosberg assigned the two collections to different varieties indicates his uncertainty as to their differences. There is a complete gradation in leaflet size, the type material of var. *melanesica* having about the largest leaflets noted (FIGURE 19C, pinna on left), whereas many specimens from southeastern Viti Levu have smaller and sometimes more numerous leaflets (FIGURE 19C, pinna on right).

DISTRIBUTION: Endemic to Fiji and widespread throughout the archipelago, although seeming most frequent near the south coast of Viti Levu. Approximately 30 collections have been studied.

LOCAL NAMES AND USES: Although *vaivai* is frequently used, application of the names *vaivai ni Viti* and *vaivai ni veikau* indicate awareness of its indigenosity. The species is considered a good timber tree, and at one time its wood was prized for canoe- and ship-building. The seeds are reported to be used for necklaces and are said to be edible (the latter seems to be dubious).

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nalotawa, eastern base of Mt. Evans Range, *Smith 4489*; Sovutawambu, south of Nandarivatu, *Degener 14657*. NANDRONGA & NAVOSA: Vicinity of Singatoka, *Greenwood 657A* (coll. H. P. Phillips). SERUA: Inland from Navutulevu, *DF S1410/3* (coll. Bola); inland from Namboutini, *DF 572* or *796 (S1410/6)*; inland from Ngaloa, *DF 594* or *818 (S1410/7)*. NAMOSI: Nambukavesi Creek, *DF S1410/2* (coll. Bola); Wainandoi River, *Mead 1962*. NATIASIRE: Waindina River, *DA 170*; Waimanu River, *DA L.13253 (Berry 57)*. REWA: Lami, *DA 1054*. KANDAVU: Naikoro-koro, *DF S1410/5 (Damanu KU.16)*. OVALAU: *Storck 887*; Port Kinnaird, *Seemann 145*. VANUA LEVU: MATHUATA: Mathuata coast, *Greenwood 657*; vicinity of Lambasa, *DF 1410/1* (coll. P. Seru). TAVEUNI: Vicinity of Somosomo, *U. S. Expl. Exped. VANUA MBALAVU*: Namalata islet, *Smith 1447*. FULANGA: On limestone formation, *Smith 1212*. ONGEA NDRIKI: On small rocky islet, *Bryan 414* (coll. R. H. Beck).

1b. *Serianthes melanesica* var. *meeboldii* Fosberg in Reinwardtia 5: 314. 1960; J. W. Parham, Pl. Fiji Isl. ed. 2. 108. 1972.

Serianthes myriadenia sensu A. Gray, Bot. U. S. Expl. Exped. 1: 485, p. p. 1854; non Planch. ex Benth.

An inadequately noted tree, probably in general similar to var. *melanesica*. The only dated specimen was flowering in July.

TYPIFICATION: The type is *Meebold 16465* (K HOLOTYPE; ISOTYPE AT BISH), collected in July, 1932, near Lami, Rewa Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji; available material does not permit comment on distribution, but it should be noted that the type was obtained at the same locality as the type of var. *macdanielsii* (here referred to var. *melanesica*).

AVAILABLE COLLECTIONS: FIJI without further locality, *Horne 367* (GH, K), *U. S. Expl. Exped.* (NY, fide Fosberg).

As representing var. *meeboldii*, Fosberg cited *Horne 267* (K); however, the specimen at K is clearly labelled 367. It closely agrees with the holotype of var. *meeboldii* and is duplicated at GH, although curiously Fosberg cited *Horne 367* (GH) as representing var. *macdanielsii*. No. 367 is the only Horne collection of *Serianthes* that I have located. Fosberg also cited *U. S. Expl. Exped.* (NY) as var. *meeboldii*. The Expedition material of *Serianthes melanesica* doubtless came from more than one locality, as Gray cited "Somu-somu (i. e. Somosomo, Taveuni), & c., Feejee Islands; on the banks of streams." The Taveuni material seems correctly placed in var. *melanesica*. The long petioles and leaf rachises of var. *meeboldii* seem to provide the only characters distinguishing it from var. *melanesica*.

2. *Serianthes vitiensis* A. Gray, Bot. U. S. Expl. Exped. 1: 485. 1854; Seem. Fl. Vit. 74. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 161. 1890; Fosberg in Reinwardtia 5: 306. 1960; J. W. Parham, Pl. Fiji Isl. 70. 1964, ed. 2. 108. 1972.

A tree to 15 m. high and with a trunk up to 60 cm. in diameter, occurring in thick forest near creeks on lower slopes of mountains (*Greenwood 617*). The only available fertile specimen is the type, in fruit.

FIGURE 19. *Serianthes melanesica* var. *melanesica*; A, distal portion of branchlet, with foliage and inflorescences, $\times 1/3$; B, partial inflorescence, $\times 1$; C, partial inflorescence and two pinnae, $\times 1$; D, mature fruit, $\times 1$. A & B from *Degener 15041*, C from *MacDaniels 1067* (partial inflorescence and pinna on right) and *Degener 15041* (pinna on left), D from *Bryan 404*.



TYPEIFICATION: The type is *U. S. Expl. Exped.* (US 62796 HOLOTYPE; putative ISOTYPES at GH, K) collected in 1840 presumably from the vicinity of Mbua Bay, Mbua Province, Vanua Levu. Gray's citation is "Feejee Islands, at Sandalwood Bay, Vanua-levu, & c.", which may imply that the material came from more than one locality; however, the three specimens could well have come from a single plant.

DISTRIBUTION: Endemic to Fiji and thus far known with certainty only from Vanua Levu.

AVAILABLE COLLECTION: VANUA LEVU: MATHUATA: Mountains near Lambasa, *Greenwood 617* (K). Seemann (1865) cited a sterile Williams specimen from Mbua Bay, but this has not been located at K or BM.

Although *Greenwood 617* is sterile, it is an excellent match for the type material of *Serianthes vitiensis*, which is readily distinguished from *S. melanesica* by its fewer leaflets (these are rarely less than 15 pairs in *S. melanesica*), which are conspicuously broader on the average and with a much more obscure and evanescent indument. Inflorescences are still unknown for *S. vitiensis*, but the fruits are broader than those of *S. melanesica* and very different in texture, as noted in the above key.

FAMILY 124. CAESALPINIACEAE

CAESALPINIACEAE R. Br. in Flinders, *Voy. Terra Australis 2: 551*, as *Caesalpineae*. 1814.

Trees, shrubs, or lianas, less often herbs, stipulate, the stipules paired, usually fugacious, sometimes lacking; leaves nearly always alternate, pinnate or bipinnate, rarely simple or unifoliolate, usually without stipels or these rarely present and minute; inflorescences axillary, terminal, or borne on old wood, rarely leaf-opposed, spicate to racemose or paniculate, rarely 1-flowered; flowers zygomorphic, less often actinomorphic, usually 5-merous and ♀, less often unisexual, sometimes with large calyxlike bracteoles covering the bud; calyx tube (hypanthium) cupuliform to tubular, sometimes absent, the sepals 5 (or 4 by the union of 2), rarely more numerous or fewer, usually free to hypanthium rim or to base of calyx, infrequently partly united, imbricate or rarely valvate; petals 5 (-6) or fewer (rarely absent), imbricate in bud, free or proximally connate, the adaxial one innermost, overlapped by adjacent lateral ones (if these are present); disk sometimes present and extrastaminal; stamens 10 or fewer, infrequently numerous, often partially reduced to staminodes, the filaments free to variously connate, the anthers basifixed or dorsifixed, 2-locular, usually dehiscent lengthwise, sometimes by apical or basal pores or short slits, lacking apical glands; ovary free, sometimes stipitate with the stipe adnate to hypanthium, unilocular, the suture ventral, the ovules 1-many, often superposed, the style undivided, the stigma terminal or subterminal; fruit 2-valved or indehiscent and drupaceous or samaroid, the seeds sometimes arillate, usually without pleurograms (areoles) and without a hilar groove, the endosperm usually lacking, the cotyledons fleshy or foliaceous, the radicle straight or slightly oblique, never folded.

DISTRIBUTION: Mostly tropical and subtropical, most numerous in tropical America, with about 152 genera and 3,000 species. Nineteen genera are known to occur in Fiji, only seven of them having indigenous species.

USEFUL TREATMENTS OF FAMILY: HUTCHINSON, J. *Caesalpinaceae*. *Gen. Fl. Pl. 1: 221-276*. 1964. BRENNAN, J. P. M. *Leguminosae Subfamily Caesalpinioideae*, 1-230. 1967. *In: Milne-Redhead, E., & R. M. Polhill (eds.). Fl. Trop. E. Afr.*

KEY TO TRIBES

Leaves simple, entire or bilobed or 2-partite, but with a pulvinus not jointed to petiole, the blades palmately nerved; sepals joined above hypanthium, the calyx limb lobed or spathaceous or 5-partite; seeds with the hilum with a crescentic parenchymal scar or transverse slit; our genus represented in Fiji by cultivated plants with large and showy flowers, the petals white to variously colored.

3. CERCIDEAE

- Leaves usually compound or unifoliolate with a jointed petiolule, occasionally simple (not in any of our representatives) but then often pinnately nerved; sepals usually free to hypanthium rim or to pedicel, or if joined above hypanthium then the leaflets numerous; seeds with the hilum with parenchyma penetrating testa only around the vascular trace.
- Hypanthium none (i. e. stamens hypogynous) or short and inflated; anthers dehiscing by lateral slits or by apical or basal pores; sepals free. 2. CASSIÆE
- Hypanthium usually cupular or tubular, or if inflated or negligible then the anthers clearly introrse or the calyx tubular; anthers dehiscing by lateral to introrse slits.
- Stipules interpetiolar or lacking; bud scales not leaving prominent, spaced scars at base of each shoot and/or buds supra-axillary; leaves in our genera bipinnate or paripinnate, without twisted petiolules or specialized glands on leaflets; bracteoles narrow, usually caducous, or lacking; stamens in our genera 10. 1. CAESALPINIÆE
- Stipules intrapetiolar, joined behind the strictly axillary bud by at least a line, often small and caducous; bud scales often well developed, leaving conspicuous, discrete scars on lower part of each shoot; leaves pinnate, paripinnate if leaflets opposite, if other leaflets alternate then with a terminal or subterminal leaflet exceeded by a frequently caducous rachis extension, or unifoliolate.
- Bracteoles small or large, usually enclosing flower bud but then imbricate or tubular with imbricate lobes. 4. DETARIÆE
- Bracteoles well developed, enclosing flower bud, valvate, usually persistent (but caducous in our genus), never tubular; our genus represented in Fiji by a cultivated tree with paripinnate leaves, the petals yellow to cream-colored, with red or purple veins. 5. AMHERSTIÆE

KEYS TO GENERA

TRIBE 1. CAESALPINIÆE

- Lowermost sepal similar to uppermost sepal, both outside in bud but sometimes valvate or calyx 2-lipped; flowers essentially actinomorphic to zygomorphic, the stamens usually spreading; leaf-axes adaxially grooved, sometimes with glands or bridges at leaflet-insertions; plants lacking thorns or prickles; leaves bipinnate; cultivated only or infrequently naturalized.
- Sepals markedly imbricate; petals yellow; fruit flattened, indehiscent (or valves eventually splitting lengthwise through middle), winged along both margins. 1. *Peltophorum*
- Sepals valvate or calyx limb 2-lipped; fruit dehiscent (sometimes tardily so), not winged, the valves woody or coriaceous.
- Calyx with 5 valvate, subequal sepals free at anthesis; petals subequal in size, in our species 4-7 cm. long, crimson or scarlet, the uppermost one yellow with red blotches; stipules in our species forked, with pinnate divisions. 2. *Delonix*
- Calyx limb 2-lipped, the upper lobes connate, the lowermost lobe somewhat separated; petals about 2.5 cm. long, orange, the uppermost one the broadest; stipules minute. 3. *Colvillea*
- Lowermost sepal modified, often forming a hood in bud; flowers zygomorphic, the stamens crowded around gynoecium at least toward base; leaf-axes adaxially ridged or rounded or flattened (not grooved), without specialized glands at leaflet-insertions; plants in our genera often with thorns or prickles; leaves bipinnate or paripinnate.
- Leaves bipinnate, the pinnae in our species 3-16, each with 3-28 pairs of leaflets; fruit indehiscent or dehiscent and 2-valved; indigenous (and then lianas with spiny fruits) or cultivated (and then shrubs or trees with unarmed fruits). 4. *Caesalpinia*
- Leaves paripinnate, with few leaflets (or partially bipinnate with lower pinnae divided); fruit with valves splitting down the middle; our species a cultivated small tree. 5. *Haematoxylum*

TRIBE 2. CASSIÆE

- Inflorescences cymose-paniculate; flowers ♂, the perianth essentially actinomorphic, the sepals and petals isomerous, each (3-) 5, the stamens perigynous, 4 or 5 or (as in our species) 10-15; fruit flat, compressed, tardily dehiscent, winged along adaxial suture, with 1-4 seeds; leaves imparipinnate, with alternate leaflets; indigenous. 7. *Storckiaella*
- Inflorescences spirally racemose or, if paniculate, composed of racemose elements; fruit terete or compressed, dehiscent or not, sometimes winged, with 2-many seeds; leaves paripinnate (rarely bipinnate), the leaflets opposite or prevailing so.
- Flowers usually unisexual but sometimes ♂, apetalous, with a fleshy hypogynous disk wider than calyx; stamens 5, the anthers dorsifixed, versatile, dehiscent through their full length; fruit compressed, indehiscent; our species an infrequently cultivated tree. 6. *Ceratonia*
- Flowers ♂, petaliferous, lacking a hypogynous disk; anthers mostly basifixed and usually dehiscent by pores or slits at apex only, sometimes dorsifixed but then dehiscent by introrse slits or basally.
- Filaments of 3 adaxial stamens sigmoidally incurved, each many times longer than its anther, this dorsifixed, subversatile, and introrsely dehiscent by slits; filaments of adaxial stamens straight,

shorter, their anthers dehiscent by basal pores; pedicels bibracteolate at or shortly above base; fruit elongate, terete or variously compressed, indehiscent, pulpy or pithy within; seeds dorsiventrally compressed, the funicle filiform, the testa smooth, without areoles; extrafloral nectaries absent; cultivated trees only. 8. *Cassia*

Filaments of all stamens straight, each shorter than or not more than twice as long as its anther; pedicels ebracteolate or, if bracteolate, the bracteoles attached at or above middle and the fruit elastically dehiscent; fruit various (but if simultaneously cylindrical, indehiscent, and internally pulpy then the pedicels ebracteolate); seeds laterally compressed, the funicle and testa various; extrafloral nectaries common; trees, woody vines, shrubs, or herbs.

Bracteoles absent; androecium commonly zygomorphic, the adaxial members often staminodial but all 10 members sometimes subequal, the anther thecae glabrous along sutures; fruit either indehiscent or inertly dehiscent through 1 or both sutures (if through 1 suture only then follicular, if through both sutures then the valves tardily separating but not coiling); seeds with the funicle filiform, the testa smooth or minutely rugulose but not pitted, often with a closed areole on each face or margin; extrafloral nectaries (when present) mounded or claviform, secreting nectar from a convex surface; indigenous, cultivated (and sometimes naturalizing), or adventive species. 9. *Senna*

Bracteoles 2; androecium essentially actinomorphic, the 2 cycles of anthers often of different lengths, the anther thecae puberulent or pilosulous along sutures; fruit elastically dehiscent, the valves coiling; seeds with the funicle deltately dilated, the testa either smooth or pitted but without areoles; extrafloral nectaries (when present) secreting nectar from a concave or flat surface; adventive or cultivated. 10. *Chamaecrista*

TRIBE 3. CERCIDEAE

One genus only in Fiji. 11. *Bauhinia*

TRIBE 4. DETARIEAE

Bracteoles free; stamens free or the filaments shortly connate (tube not exceeding ovary).

Leaflets opposite or nearly so; petals none, 1, 3 or 5 (4-6) (if none then bracteoles usually colored and showy and sepals petaloid).

Flowers in racemes (as in our species) or somewhat pyramidal panicles, often congested; petals (4 or 5 (rarely 6), subequal; leaflets not glandular-punctate; indigenous genera (one species of no. 12 cultivated).

Stamens usually 10 (8-12), the filaments free to base or essentially so; inflorescence rachis slender (in our species 1.5-3 mm. in diameter proximally, the sepals up to 6 mm. long, the petals up to 9 mm. long); fruit tuberculate to smooth; leaf buds with comparatively small perules (these in our species, like inflorescence bracts, not exceeding 1 cm. in length). 12. *Cynometra*

Stamens 15-80 (usually 21-40 in our species), the filaments sometimes connate at base; inflorescence rachis usually comparatively stout (in our species 2-6 mm. in diameter proximally, the sepals 5-16 mm. long, the petals 7-19 mm. long); fruit smooth; leaf buds with conspicuous, larger perules (these in our species, like inflorescence bracts, often exceeding 1 cm. in length, sometimes 3 cm. or more long). 13. *Maniltoa*

Flowers in subcorymbose or rarely elongate panicles (less often in simple racemes); petals 1 or 3 or lacking; leaflets sometimes glandular-punctate.

Petals 3 or lacking; stamens usually 4-8; flowers in bud with 3 or 4 sepals visible; fruit valves sometimes twisting or dispersing with 1 seed; cultivated only.

Leaflets with a strong, continuous marginal nerve, this usually with several small crateriform glands along its length; bracts and bracteoles showy; petals 3, equal, exserted, long-clawed; stamens 6, the filaments connate at base, 2 of them minute and with abortive anthers.

14. *Lysidice*

Leaflets without a marginal nerve; bracteoles colored, shorter than calyx tube, this elongated, with 4 (-6) petaloid, showy sepals; petals lacking; stamens (3-) 4-8 (-10), with elongated filaments.

15. *Saraca*

Petal 1, large, clawed (the others rudimentary or lacking); fertile stamens 3; staminodes 4-7, filiform; flowers in bud with 2 sepals outside and 2 concealed; fruit valves not twisting, the seeds exarillate (funicle slightly fleshy); leaflets with twisted petiolules, not glandular-punctate but often with 1 or 2 glands near base; indigenous. 16. *Intsia*

Leaflets alternate, usually 3-7, glandular-punctate; petals none; bracts and bracteoles minute; indigenous.

17. *Kingiodendron*

Bracteoles united into a bilobed tube, conspicuous, persistent; flowers showy, spirally arranged, the petals 5, well developed; stamens 10-15, the filaments joined into a well-developed tube or at least basally connate; cultivated only. 18. *Brownea*

TRIBE 5. AMHERSTIEAE

One genus only in Fiji. 19. *Tamarindus*

1. *PELTOPHORUM* Benth. in J. Bot. (Hooker) 2: 75. 1840; Hutchinson, Gen. Fl. Pl. 1: 262. 1964; Verdcourt, Man. New Guinea Leg. 16. 1979. Nom. cons.

Trees, the stipules small, caducous; leaves bipinnate, without glands on petiole or rachis, the leaflets numerous, small, opposite; inflorescences axillary and racemose or (as in our species) terminal and composed of racemes aggregated into a panicle, the bracts lanceolate, often caducous, the bracteoles none; calyx tube patelliform, the sepals 5, imbricate, slightly unequal, reflexed; petals 5, imbricate, subequal, orbicular to ovate, becoming spreading, pilose at base; stamens 10, free, the filaments curved, pilose at base; ovary substipitate, the ovules 2 or more, the style filiform, the stigma broadly peltate; fruit oblong-lanceolate, compressed, indehiscent, winged along both sutures, the seeds 1-6, transverse, compressed.

TYPE SPECIES: *Peltophorum vogelianum* Walp., nom. illeg. = *P. dubium* (Spreng.) Taubert (*Caesalpinia dubia* Spreng.).

DISTRIBUTION: Tropical and subtropical, with 7-9 (-15?) species. One species is cultivated in Fiji.

1. *Peltophorum pterocarpum* (DC.) Backer ex K. Heyne, Nutt. Pl. Ned.-Ind. ed. 2: 2: 755. 1927; J. W. Parham, Pl. Fiji Isl. ed. 2: 102. 1972; Verdcourt, Man. New Guinea Leg. 16. fig. 1. 1979.

Inga pterocarpa DC. Prodr. 2: 441. 1825.

Caesalpinia inermis Roxb. Fl. Ind. ed. 2: 367. 1832.

Caesalpinia ferruginea Dec. in Nouv. Ann. Mus. Hist. Nat. 3: 462. 1834.

Peltophorum ferrugineum Benth. Fl. Austral. 2: 279. 1864; J. W. Parham, Pl. Fiji Isl. 66. 1964.

Peltophorum inermis Llanos in Blanco, Fl. Filip. ed. 3: t. 335. 1877-1883; Merr. Enum. Philipp. Fl. Pl. 2: 269. 1923; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 91. 1948, in op. cit. 29: 33. 1959.

A tree 8-15 m. high, with a spreading crown, cultivated in Fiji near sea level. The leaves have 4-15 pairs of pinnae, each with 8-20 pairs of leaflets 8-30 × 3.5-10 mm. and rounded or emarginate at apex. The fragrant flowers have canary-yellow petals 1-2 cm. long, with frilly margins; the reddish brown fruit is 5-11.5 cm. long and 2-2.7 cm. broad, the valves at length splitting lengthwise through the middle. Our specimens bore flowers in March and October, fruits only in March.

TIPIFICATION AND NOMENCLATURE: *Inga pterocarpa* is typified by a specimen from Timor (no collector mentioned by de Candolle) (P HOLOTYPE); *Caesalpinia inermis* by a specimen from the Moluccas; and *Caesalpinia ferruginea* by several collections from Timor, among which no holotype was indicated by Decaisne. The three names in *Peltophorum* based on these basionyms have been widely used.

DISTRIBUTION: Southeastern Asia through Malesia to northern Australia, widely cultivated in tropical areas.

LOCAL NAMES AND USES: *Golden flamboyant*, *yellow poinciana*, and *yellow flame tree* are used for this striking ornamental tree, which is desirable as a street tree and for shade in gardens. Elsewhere the species is used as shade for coffee, and a yellow dye is obtained from the bark.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Tholo-i-suva, *Damanu* 33; Nasinu Experiment Station, *DA* 1559. REWA: Suva, *DA* 12241; on or near Department of Agriculture grounds, Suva, *DA*, Nov. 1949, 12061; Suva, in private garden, *DA* 16777.

2. *DELONIX* Raf. Fl. Tellur. 2: 92. 1837; Hutchinson, Gen. Fl. Pl. 1: 265. 1964; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 23. 1967; Verdcourt, Man. New Guinea Leg. 29. 1979.

Trees, the stipules inconspicuous (but in our species forked at base, the divisions pinnate); leaves bipinnate, without glands on petiole and rachis, the leaflets numerous,

small, opposite; inflorescences axillary, corymbose-racemose, aggregated near ends of branchlets, the bracts small, caducous, the bracteoles none; flowers large and showy; calyx tube short, the sepals 5, valvate, subequal; petals conspicuously clawed, imbricate, subequal or the uppermost dissimilar; stamens 10, free, exerted, alternately slightly longer and shorter, the filaments short-villose at base; ovary short-stipitate, the ovules numerous, the style filiform, subclavate distally, the stigma truncate, ciliate; fruit linear-oblong, compressed, septate, dehiscent, the valves woody or coriaceous, the seeds numerous, transverse (oblong-subcylindric in our species), with a hard testa.

TYPE SPECIES: *Delonix regia* (Bojer ex Hook.) Raf. (*Poinciana regia* Bojer ex Hook.).

DISTRIBUTION: Eastern Africa and Madagascar to India, with about ten species. One species is cultivated in Fiji.

1. **Delonix regia** (Bojer ex Hook.) Raf. Fl. Tellur. 2: 92. 1837; Yuncker in Bishop Mus. Bull. 178: 60. 1943; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 90. 1948, in op. cit. 29: 32. 1959; Yuncker in Bishop Mus. Bull. 220: 136. 1959; J. W. Parham, Pl. Fiji Isl. 64. 1964, ed. 2. 99. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 56. 1970; Verdcourt, Man. New Guinea Leg. 30. fig. 5. 1979.

Poinciana regia Bojer ex Hook. in Bot. Mag. 56: t. 2884. 1829.

A spreading tree to 15 m. high, cultivated and infrequently naturalized from near sea level to an elevation of about 500 m. The leaves usually have 11-20 pairs of pinnae, each with 10-25 pairs of leaflets 5-10 × 2-5 mm. The sepals are yellowish without and red within; the petals are 4-7 cm. long, crimson or scarlet but one of them yellow with red blotches; the filaments are red distally; and the oblong fruit, up to 70 × 7 cm., has yellowish and brown seeds. Flowers in Fiji have been noted from October to March, fruits in July and August but long-persistent.

TYPIFICATION: Bojer sent Hooker the drawing reproduced in the original 1829 publication, which may be taken as the type; the locality mentioned was near Foule Point, Madagascar.

DISTRIBUTION: Endemic and rare in Madagascar, now widely cultivated throughout the tropics. Although Parham (1964, 1972) states that the species was introduced into Fiji prior to 1860, the earliest record that I have located is that of Thurston in 1886.

LOCAL NAMES AND USE: Often known in Fiji as *sekoula*; the common English names are *flamboyant*, *flame tree*, and *poinciana*. It is a striking ornamental, more frequently grown than the few collections suggest and to be found in many villages.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Along road between Waikumbukumbu and Nandarivatu, Gillespie 4379. REWA: Suva, in Department of Agriculture compound, DA 12191, 16478. TAVEUNI: Vicinity of Waiyevo, Smith 8312.

3. **COLVILLEA** Bojer ex Hook. in Bot. Mag. 61: t. 3325, 3326. 1834; Hutchinson, Gen. Fl. Pl. 1: 265. 1964.

Spreading trees, the stipules minute, caducous; leaves bipinnate, the leaflets numerous, small; inflorescences densely racemose, the rachis thickened, the bracts membranaceous, colored, caducous, the bracteoles none; flowers showy; calyx tube short, the limb ventricose, 2-lipped, the upper lobes connate, the lowermost lobe somewhat separated; petals 5, imbricate, the uppermost one the broadest; stamens 10, free, the filaments pilose at base, longer than petals; ovary short-stipitate, the ovules numerous, the style filiform, the stigma small; fruit straight, elongated, the valves woody or coriaceous, the seeds transverse, oblong.

TYPE SPECIES: *Colvillea racemosa* Bojer ex Hook.

DISTRIBUTION: Endemic to Madagascar and with a single species, cultivated in other tropical areas.

1. *Colvillea racemosa* Bojer ex Hook. in Bot. Mag. **61**: t. 3325, 3326. 1834; J. W. Parham in Agr. J. Dept. Agr. Fiji **19**: 90. 1948, Pl. Fiji Isl. 64. 1964, ed. 2. 99. 1972.

A spreading tree to 18 m. high, infrequently cultivated near sea level. The leaves have 10–20 pairs of pinnae, each with 20–32 pairs of leaflets 5–10 × 2–4 mm. The flower buds are orange-red, the calyx being about 2 cm. long, the petals orange and slightly longer than the calyx, and the stamens yellow, with filaments about 3 cm. long. The oblong fruit, up to about 30 × 6 cm., is narrowed at both ends. In Fiji flowers are seen in February and March.

TYPIFICATION: Hooker noted that Bojer found a single tree cultivated at the Bay of Bombatoe, Madagascar, in 1824 and took seeds to Mauritius. Probably a plant cultivated in Mauritius should be considered the type.

DISTRIBUTION: Endemic to Madagascar and now frequently cultivated elsewhere. It may have been introduced into Fiji by Thurston, being listed in his *Catalogue* of 1886.

LOCAL NAME AND USE: *Colvillea* is used as the vernacular name of this striking ornamental.

AVAILABLE COLLECTION: VITI LEVU: REWA: Suva, DA 7571. Parham (1948, cited above) noted its occurrence in the Suva Botanical Gardens.

4. CAESALPINIA L. Sp. Pl. 380. 1753; Seem. Fl. Vit. 66. 1865; Hutchinson, Gen. Fl. Pl. **1**: 260. 1964; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 28. 1967; Hattink in Reinwardtia **9**: 9. 1974; Verdcourt, Man. New Guinea Leg. 20. 1979.

Trees, shrubs, or scrambling or climbing plants, unarmed or armed with spines or prickles, the stipules various, minute to leafy, or lacking; leaves bipinnate (rarely reduced to scales but not in our species), the leaflets opposite, less often alternate, few to many; inflorescences racemose or paniculate, in upper leaf axils or terminal, rarely 1-few-flowered, the bracts caducous; flowers ♂ or unisexual; calyx tube short, the sepals 5, imbricate, sometimes very narrowly so, subequal or the lowermost one cucullate, often larger, clasping the others; petals 5, imbricate, spreading, orbicular or oblong, subequal or the uppermost smaller and clawed; stamens 10, free, alternately longer and shorter, the filaments often villose or glandular; ovary sessile or short-stipitate, free, the ovules few (usually 2–10), the style filiform, rarely clavate distally, the stigma terminal, oblique, ciliolate or glabrous; fruit compressed to rarely cylindrical, not winged or winged along dorsal suture, hard and woody or thick and pulpy, indehiscent or dehiscent and 2-valved, the seeds transverse, hard.

LECTOTYPE SPECIES: *Caesalpinia brasiliensis* L. (vide Britton & Wilson, Sci. Surv. Porto Rico, 377. 1924), one of Linnaeus's four original species.

DISTRIBUTION: Pantropical and subtropical, sometimes warm-temperate, probably with about 100 species. Six species are known to occur in Fiji, two of them indigenous and the others cultivated.

USEFUL TREATMENT OF GENUS: HATTINK, T. A. A revision of Malesian Caesalpinia, including Mezoneuron (Leguminosae-Caesalpiniaaceae). Reinwardtia **9**: 1–69. 1974.

The difficulties of reaching a satisfactory circumscription of *Caesalpinia* are discussed by Polhill and Vidal (in Adv. Leg. Syst. 84–85. 1981). The genus is now generally taken to include such groups as *Guilandina* L. (*C. bonduc* and *C. major* in this treatment) and *Poinciana* L. sensu str. (*C. pulcherrima*).

KEY TO SPECIES

Stamens long-exserted, the filaments 5–7.5 cm. long, mostly scarlet; petals 15–25 mm. long, scarlet to orange-red or yellow, the standard long-clawed; pedicels 2.5–10 cm. long; fruits unarmed, dehiscent, up to 11 × 2 cm.; leaflets 5–13 pairs per pinna, seldom larger than 30 × 15 mm.; cultivated.

1. *C. pulcherrima*

Stamens shorter, not as conspicuously exerted; petals yellow or cream-colored; pedicels not more than 4 cm. long.

Lianas, the stems often armed with spines and prickles; fruits copiously spreading-spinose (spines 5–10 mm. long), ovoid-oblong, dehiscent, the seeds very hard, ovoid to globular, 15–20 mm. long; flowers unisexual, the ♂ flowers with a small, pilose, rudimentary ovary, the ♀ flowers with the ovary 7–8 mm. long and the anthers without pollen; leaves with 3–11 pairs of pinnae, each with 3–12 pairs of leaflets; indigenous.

Stipules pinnate, subsistent, leafy, composed of 2–5 lobes up to 25 mm. in diameter or larger; leaflets 6–12 pairs per pinna, opposite or subopposite, ovate- to elliptic-oblong, 1.5–6.5 cm. long, 0.5–3 cm. broad, inaequilaterally rounded or cuneate at base, obtuse to subacute at apex; fruits 4.5–9 × 3–5 cm., the seeds 1 or 2, gray or olive-green at maturity; pedicels at anthesis 2–6 mm. long; ovules 2.

2. *C. bonduc*

Stipules subulate, 1–3 mm. long, often split into 2 or 3 superposed parts, caducous; leaflets 3–7 pairs per pinna, opposite or alternate, ovate-oblong to suborbicular, 3–13 cm. long, 1.5–6.5 cm. broad, subsymmetrically acute to rounded at base, acute or acuminate to rounded or emarginate at apex; fruits 5–13 × 4–6 cm., the seeds 2–4, yellow to brownish at maturity; pedicels at anthesis 6–12 mm. long; ovules 4.

Shrubs or trees; fruits unarmed; flowers ♀; leaves, with 3–16 pairs of pinnae, each with 5–28 pairs of leaflets; cultivated.

Petals 3–6 mm. long; inflorescences 2–6 cm. long; pedicels 2–4 mm. long; fruits oblong to ovate, 3–6 cm. long, 1–3 cm. broad, inflated, indehiscent, becoming twisted or coiled; stems and leaves unarmed; leaves with 3–9 pairs of pinnae, each with 15–28 pairs of leaflets 4–9 × 1.5–2.5 mm.

4. *C. coriaria*

Petals 9–15 mm. long, the uppermost red-veined or -blotched; inflorescences 10–40 cm. long; pedicels 1.5–3 cm. long; fruits oblong to elliptic, 6–10 cm. long, 3–4 cm. broad, tardily dehiscent, not twisted or contorted; stems and leaves with prickles.

Pinnae 3–15 pairs, 2.5–10 cm. long, each with 5–12 pairs of leaflets, these usually 8–20 × 3–8 mm., the midrib subcentral; stipules 0.4–2 cm. long, subsistent; fruits with 4–9 seeds, these 9–12 mm. long; climbing or straggling shrub.

5. *C. decapetala*

Pinnae 7–16 pairs, 6.5–17 cm. long, each with 10–20 pairs of leaflets, these 10–25 × 3–11 mm., the midrib excentric; stipules 3–4.5 cm. long, fugacious; fruits with 2–4 seeds, these 15–18 mm. long; tree or shrub.

6. *C. sapan*

1. *Caesalpinia pulcherrima* (L.) Sw. Obs. Bot. 166. 1791; Seem. Fl. Vit. 74. 1865; Christophersen in Bishop Mus. Bull. 128: 100. 1935; Yuncker in op. cit. 178: 61. 1943; Greenwood in Proc. Linn. Soc. 154: 97. 1943; Yuncer in Bishop Mus. Bull. 220: 137. 1959; J. W. Parham in Agr. J. Dept. Agr. Fiji 29: 31. 1959, Pl. Fiji Isl. 63. 1964, ed. 2. 96. 1972; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 31. 1967; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 55. 1970; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 60. 1972; Hattink in Reinwardtia 9: 50. 1974; St. John in Phytologia 36: 369. 1977; Verdcourt, Man. New Guinea Leg. 27. fig. 4. 1979.

Poinciana pulcherrima L. Sp. Pl. 380. 1753; Seem. Viti, 435. 1862.

A shrub 1–3 m. high (to 6 m. elsewhere), frequently cultivated near sea level (not recorded as naturalized in Fiji). The inflorescences, up to 40 cm. long, bear striking flowers, the petals being scarlet to yellow, often with orange margins, and the filaments red. The fruits are purple to blackish brown and enclose brown seeds about 10 mm. long. Available specimens bore flowers and fruits in April and June, but plants are commonly seen in Fijian towns and villages with flowers at other times.

TYPIFICATION: The specimen at LINN numbered 529.1 may be considered the holotype (fide Brenan, 1967, cited above).

DISTRIBUTION: Almost certainly indigenous in tropical America, but widely cultivated and frequently naturalized elsewhere.

LOCAL NAME AND USE: *Pride of Barbados* is commonly used in Fiji, as elsewhere. This beautiful ornamental has been grown in Fiji since before 1860, when Seemann observed it but apparently did not prepare a specimen.



FIGURE 20. *Caesalpinia bonduc*, from Smith 7911; foliage and fruits, from the edge of a forest along a rocky shore on Ngau, \times about 1/3.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Lautoka, *Greenwood* 84. NAITASIRI: Principal Agricultural Station, Koronivia, *DA 11913*. REWA: Suva, *Lady Cecil* 236; Suva Botanical Gardens, *DA 12088*. VANUA LEVU: THAKAUDROVE: Namale, near Savusavu, *DA 16860*.

2. *Caesalpinia bonduc* (L.) Roxb. Fl. Ind. ed. 2. 2: 362. 1832; Dandy & Exell in J. Bot. 76: 179. 1938; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 37. 1967; J. W. Parham, Pl. Fiji Isl. ed. 2. 96. 1972; Hattink in Reinwardtia 9: 17. 1974; Verdcourt, Man. New Guinea Leg. 23. fig. 3 (7, 8). 1979. FIGURE 20.

Guilandina bonduc L. Sp. Pl. 381. 1753.

Caesalpinia crista L. Sp. Pl. 380, p. p. (quoad syn. Pluk. et Breyn.). 1753; sensu Urb. Symb. Antill. 2: 269. 1900; Merr. Interpret. Rumph. Herb. Amb. 260. 1917; J. W. Parham, Pl. Fiji Isl. 62. 1964, ed. 2. 96. 1972; non sensu str.

Guilandina bonducella L. Sp. Pl. ed. 2. 545, nom. illeg. 1762.

Caesalpinia bonducella Fleming in Asiat. Res. 11: 159, nom. illeg. 1810; Seem. Fl. Vit. 66, p. p. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 157, p. p. 1890.

A high-climbing liana, sometimes noted as a scrambling shrub and then to 5 m. high, occurring at elevations from near sea level to 900 m. in coastal thickets or dense forest or on forest edges. The petals are yellow or greenish yellow, the upper one sometimes orange at base, the filaments and style are greenish, and the seeds are gray or olive-green when mature. Flowering material has been collected between March and May, fruits between May and January.

TYPIFICATION: The lectotype designated by Dandy and Exell (1938, cited above) is Herb. Hermann, vol. 3, fol. 35 (BM), from Ceylon.

DISTRIBUTION: Widespread in tropical areas of both hemispheres.

LOCAL NAMES AND USE: *Soni* is the usual name, but also recorded are *soni ni Viti*, *nggalau sori*, and *wa nggiri*. In the Yasawas the root is prepared with other plants and taken internally for rheumatism (*Weiner 238*).

AVAILABLE COLLECTIONS: YASAWAS: YASAWA: Tamasua Village, *Weiner 238*. Sawa-i-Lau Island, south of Yasawa, *DA 13662*. VITI LEVU: MRA: Northern portion of Mt. Evans Range, between Mt. Vatuyanitu and Mt. Natondra, *Smith 4347*; Vatia Point, Tavua, *DA 2817*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 12658* (*Melville et al. 7033*), 13345. RA: Ellington Point, *DA 7898*; vicinity of Rewasa, near Vaileka, *Degener 15532*. REWA: Nukulau Island, *Tothill 125A*. NGAU: Shores of Herald Bay, vicinity of Sawaieke, *Smith 7911*. VANUA LEVU: MATHUATA: Nakuthi Island, off mouth of Ndreketi River, *DA 15286*. VANUA MBALAVU: Southern limestone section, *Smith 1459*.

3. *Caesalpinia major* (Medik.) Dandy & Exell in J. Bot. **76**: 180. 1938; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 54. 1970; J. W. Parham, Pl. Fiji Isl. ed. 2. 96. 1972; Fosberg in Taxon **22**: 162. 1973; Hattink in Reinwardtia **9**: 39. 1974; Verdcourt, Man. New Guinea Leg. 26. 1979.

Guilandina bonduc sensu L. Sp. Pl. ed. 2. 545, p. p. (excl. syn. Pluk.). 1762; A. Gray, Bot. U. S. Expl. Exped. **1**: 461. 1854; Seem. in Bonplandia **9**: 255. 1861, Viti, 435. 1862; non L. (1753).

Bonduc majus Medik. Theodora, 43. t. 3 (upper part) (excl. syn. L.). 1786.

Caesalpinia bonduc sensu Roxb. Hort. Beng. 32. 1814, Fl. Ind. ed. 2. 2: 362, p. p. (excl. lectotyp.). 1832; Seem. Fl. Vit. 66. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 157. 1890; Urb. Symb. Antill. 2: 272. 1900; Yuncker in Bishop Mus. Bull. **178**: 61. 1943; J. W. Parham, Pl. Fiji Isl. 62. 1964; non L.

Caesalpinia bonducella sensu Seem. Fl. Vit. 66, p. p. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 157, p. p. 1890; non Fleming.

Caesalpinia jayabo Maza in Anales Soc. Esp. Hist. Nat. **19**: 234, p. p., nom. illeg. 1890; Merr. Interpret. Rumph. Herb. Amb. 261. 1917; Christophersen in Bishop Mus. Bull. **128**: 99. 1935; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 15. 1972.

Caesalpinia crista sensu Yuncker in Bishop Mus. Bull. **220**: 136. 1959; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 15. 1972; non L.

An often high-climbing liana, found from sea level to an elevation of about 300 m. in coastal thickets or forest. The flowers have green to dull red sepals, yellow petals, green filaments, and orange anthers; the seeds are yellow to brownish at maturity. Flowers have been obtained between December and March, fruits from May to December.

TYPIFICATION AND NOMENCLATURE: As previous authors had not typified the name, Hattink (1974, cited above) suggests that Rumphius's plate of *Frutex globulorum* (Rumph. Herb. Amb. **5**: t. 48. 1747) be taken as the type of *Bonduc majus*. The complex problems involved in the nomenclature of *Caesalpinia major* and *C. bonduc* were clarified by Dandy and Exell (in J. Bot. **76**: 175–180. 1938), whose resolution has been accepted by most concerned botanists. The new name *C. globulorum* Bakh. f. & van Royen (in Blumea **12**: 62. 1963) in place of *C. major* is not required (cf. Fosberg, 1973, cited above).

DISTRIBUTION: Tropical and warm north temperate America, and also Madagascar and southeastern Asia throughout Malesia and into the Pacific to Hawaii.

LOCAL NAMES: Like *Caesalpinia bonduc*, the present species is known as *soni* in Fiji. On Kambara I noted the name *soni ni mbeka*.

AVAILABLE COLLECTIONS: MBENGGGA: Malambi, *Weiner 227*. VANUA LEVU: MATHUATA: Along coast, *Greenwood 670*; mountains near Lambasa, *Greenwood 629*. THAKAUNDRUVE: Mbalanga, Savusavu Bay, *DA 13178*. TAVEUNI: Track to lake above Somosomo, *DA 14076*; vicinity of Wairiki, *Gillespie 4754.1*; without further locality, *Gillespie 4659, 4760.5*. MOALA: *Bryan 311*. VANUA MBALAVU: Near Lomaloma, *Garnock-Jones 1045*. VUANGGAVA: *Bryan*, Aug. 27, 1924 (BISH, seeds only). KAMBARA: On limestone formation, *Smith 1288*. FIJI without further locality, *Seemann 132*.

In Fiji both *Caesalpinia major* and *C. bonduc* may be found in coastal thickets, and both occur in inland forests. From the available material, *C. bonduc* seems to reach a higher elevation than *C. major*, but this is probably not consequential. In general, it may be noted that *C. bonduc* is frequent on Viti Levu, while no Viti Levu specimens of *C. major* are at hand; the latter seems more frequent in the Lau Group than *C. bonduc*, although both have been found there.

4. *Caesalpinia coriaria* (Jacq.) Willd. Sp. Pl. 2: 532. 1799; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 90. 1948, Pl. Fiji Isl. 62. 1964, ed. 2. 96. 1972; Verdcourt, Man. New Guinea Leg. 23. 1979.

Poinciana coriaria Jacq. Select. Stirp. Amer. 123. t. 175, fig. 36. 1763.

A tree 4–8 m. high, infrequently cultivated near sea level. The petals are pale yellow or cream-colored, and the fruit becomes twisted or contorted. Flowers have been noted in March, fruits in July.

TYPEFICTION: Jacquin noted his material as having been obtained on Curaçao and in the vicinity of Cartagena, Colombia.

DISTRIBUTION: Tropical America, occasionally cultivated elsewhere.

LOCAL NAME AND USES: The indigenous American name *divi-divi* is used for this ornamental tree in Fiji. Elsewhere the fruits are sometimes used for tanning and for ink-making.

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Suva Botanical Gardens, DA 12168, 12339.

5. *Caesalpinia decapetala* (Roth) Alston in Trimen, Handb. Fl. Ceylon 6: 89. 1931; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 36. 1967; Hattink in Reinwardtia 9: 24. 1974; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 219: 79, fig. 24. 1977.

Reichardia decapetala Roth, Nov. Pl. Sp. 212. 1821.

Caesalpinia sepiaria Roxb. Hort. Beng. 32, nom. nud. 1814, Fl. Ind. ed. 2. 2: 360. 1832; Greenwood in Proc. Linn. Soc. 154: 93. 1943; J. W. Parham, Pl. Fiji Isl. 63. 1964, ed. 2. 97. 1972.

A climbing or straggling shrub or small tree, infrequently cultivated near sea level. The flowers have pale yellow petals, the standard being veined or blotched with red, and the anthers are red to purple.

TYPEFICTION AND NOMENCLATURE: The type of *Reichardia decapetala* is *Heyne* (possible ISOTYPE at κ , fide Brenan, 1967), collected in India. The species has often been known as *Caesalpinia sepiaria*, said by Roxburgh to have been introduced into the country (India) by General Martin; a probable ISOTYPE is *Roxburgh* in *Wallich 5834a* (κ), fide Brenan (1967).

DISTRIBUTION: Tropical and subtropical Asia, now widely cultivated and often naturalized, as on Raoul, Kermadec Islands, where it is considered a threat to the indigenous vegetation (Sykes, 1977, cited above).

LOCAL NAME AND USE: No local name was recorded in Fiji, but elsewhere the species is known as *Mysore thorn*. It is often used as a hedge plant, but apparently not frequently in Fiji.

AVAILABLE COLLECTION: VITI LEVU: REWA: Suva, near Golf Club, *Tohill 124*.

6. *Caesalpinia sappan* L. Sp. Pl. 381. 1753; J. W. Parham, Pl. Fiji Isl. 63. 1964, ed. 2. 96. 1972; Hattink in Reinwardtia 9: 51, fig. 4 (17). 1974; Verdcourt, Man. New Guinea Leg. 27. 1979.

A tree or shrub 3–4 m. high (as noted in Fiji, but up to 10 m. elsewhere), cultivated only near sea level. The petals are yellow, the standard being red-veined proximally, and the fruit is green, becoming brown, with dull black seeds. Flowers were noted in January, fruits in January, June, and September.

TYPIFICATION: The principal basis of the species is *Hermann*, vol. 4, fol. 31 (BM LECTOTYPE), from Ceylon (fide Hattink, 1974).

DISTRIBUTION: The indigenous area of *Caesalpinia sappan* seems to be uncertain, but it is now cultivated in the tropics of both hemispheres.

LOCAL NAME AND USES: *Sappan* is used as a vernacular name in Fiji, as elsewhere. The species is used as an ornamental and is sometimes cultivated as a hedge plant. The wood yields red and black dyes, tannin, and useful timber.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Principal Agricultural Station, Koronivia, DA 12349. TAILLEVU: Korovou, DA 5650. REWA: Suva, in private garden, DA 15374.

5. *HAEMATOXYLUM* L. Sp. Pl. 384. 1753; Hutchinson, Gen. Fl. Pl. 1: 236, as *Haematoxylon*. 1964.

Trees or shrubs, sometimes with spiny branchlets, the stipules spinelike or small and caducous; leaves paripinnate (or partially bipinnate with lower pinnae divided), the leaflets few, closely veined; inflorescences axillary, racemose; flowers small, the bracts minute, the bracteoles none; calyx tube short, the sepals 5, broadly imbricate, slightly unequal, soon deciduous; petals 5, imbricate, subequal; stamens 10, free, the filaments pilose at base; ovary short-stipitate, free, the ovules 2 or 3, the style filiform, the stigma small, terminal; fruit lanceolate or elliptic-oblong, compressed, the valves membranaceous, splitting down the middle, the seeds transversely oblong.

TYPE SPECIES: *Haematoxylum campechianum* L.

DISTRIBUTION: Tropical America and southwestern Africa, with three species, one of which is occasionally cultivated in Fiji.

1. *Haematoxylum campechianum* L. Sp. Pl. 384. 1753; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 115. 1939; J. W. Parham, Pl. Fiji Isl. 74. 1964, ed. 2. 99. 1972.

A thorny tree to 10 m. high, occasionally cultivated near sea level. The paripinnate leaves have 3-5 pairs of leaflets, each obovate, emarginate or subtruncate at apex, and usually 2-3 × 1-2.5 cm. The racemes in flower and fruit are 6-12 cm. long, the flowers being fragrant, with yellow or purple-tinged sepals and bright yellow petals. The lanceolate fruits are up to 6 × 1.2 cm. Our only dated collection was flowering in July.

TYPIFICATION: Several earlier references were given by Linnaeus.

DISTRIBUTION: Tropical America, now widely cultivated elsewhere. It seems to have been introduced into Fiji in the 1880's by J. B. Thurston, who listed it in his *Catalogue* (1886).

LOCAL NAME AND USES: *Logwood*; an ornamental plant, sometimes used in hedges. The heartwood is the source of a red dye (haematoxylin) which may turn black and is used as a stain and in ink-making.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Agricultural Station, Singatoka, DA 8303. NAITASIRI: Experiment Station, Nasinu, DA 1556. REWA: Suva Botanical Gardens, DA 3305, 3308; Suva, in private garden (formerly Thurston's "Thornbury," cf. vol. 1, p. 47 of this *Flora*), DA 16077. B. E. V. Parham (1939) mentioned that the species was then doing well and flowering on the property of W. L. Wallace, Tovu Island, Ra Province, Viti Levu.

6. *CERATONIA* L. Sp. Pl. 1026. 1753; Hutchinson, Gen. Fl. Pl. 1: 255. 1964.

Polygamodioecious trees, the stipules minute or lacking; leaves paripinnate (rarely bipinnate), the leaflets few, prevailingly opposite; inflorescences racemose, axillary, terminal, or clustered on older wood; flowers small, solitary or fasciculate, usually unisexual but sometimes ♂, the bracts and bracteoles minute, deciduous; calyx tube short-turbinate, the segments 5, imbricate; petals none; stamens 5 (vestigial in ♀ flowers), the filaments filiform, the anthers dorsifixed, versatile, dehiscent by lateral

slits; disk fleshy, hypogynous, intrastaminal, wider than calyx; ovary short-stipitate (vestigial in ♂ flowers), the ovules numerous, the style short, the stigma peltate; fruit elongated, compressed, thick, indehiscent, thickened along sutures, divided within by pulp between seeds, the seeds transverse, obovate, compressed.

TYPE SPECIES: *Ceratonia siliqua* L.

DISTRIBUTION: Mediterranean region and northeastern Africa and Arabia, with two species, one of which has been cultivated in Fiji.

1. *Ceratonia siliqua* L. Sp. Pl. 1026. 1753; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 113. 1939.

A small tree (or up to 15 m. high where indigenous), infrequently cultivated near sea level. The leaves usually have 2-5 pairs of coriaceous, rounded leaflets about 4-6 cm. long. The flowers are greenish to reddish, and the fruit is 12-30 cm. long and about 2 cm. thick.

TYPIFICATION: Linnaeus listed several prior references, including one to *Hortus Upsaliensis*.

DISTRIBUTION: Indigenous in the Mediterranean region, now occasionally cultivated elsewhere.

LOCAL NAMES AND USE: This very distinct species is widely known as *carob*, *locust bean*, and *St. John's bread*; the fruits may be used for fodder.

Although no vouchers support the record in Fiji, Parham noted that the species was introduced in 1924 and in 1939 was doing well on the property of W. L. Wallace, Tovu Island, Ra Province, Viti Levu. It may still be in cultivation in seasonally dry areas.

7. *Storckiella* Seem. in Bonplandia 9: 255, nom. nud. 1861, in op. cit. 9: 363. (December) 1861, Fl. Vit. 68. 1865; A. C. Sm. in J. Arnold Arb. 36: 279. 1955; Hutchinson, Gen. Fl. Pl. 1: 228, as *Storkiella*. 1964.

Trees, the stipules minute, caducous; leaves imparipinnate, with small, ellipsoid, axillary buds, the petiole conspicuously swollen at base, the leaflets alternate; inflorescences terminal, cymose-paniculate, the bracts and bracteoles small, lanceolate, caducous; pedicels bibracteolate at or near base, distally swollen into a short-turbinate calyx tube infilled with nectarial tissue, the sepals (3-) 5, subequal, imbricate; petals (3-) 5, subequal, imbricate, obovate-oblong, slightly longer than or subequal to sepals; stamens 4 or 5 (-6) or 9-15, free, exserted, all fertile, the filaments filiform, the anthers narrowly oblong, dorsifixed near base, dehiscent by short, oval, introrsely oblique, apical slits; ovary short-stipitate, free, the ovules 4-6, the style short, subulate, the stigma terminal, small; fruit elliptic to oblong, flat, compressed, broadly winged along upper suture, dehiscent and 2-valved, the valves thin-coriaceous, the seeds 1-4, transverse, compressed-ellipsoid.

TYPE SPECIES: *Storckiella vitiensis* Seem.

DISTRIBUTION: Queensland, New Caledonia, and Fiji, with four or five or probably more species, one of which is endemic in Fiji. The New Caledonian species were first thought to have only four or five stamens and were placed by Baillon in a separate section *Doga* (based on *Storckiella pancheri* Baill.). However, it is now seen that some New Caledonian specimens have 9-14 stamens (H. S. MacKee in litt.). The recently described *S. australiensis* J. Ross & B. Hyland (in Muelleria 5: 215, fig. 1. 1983) has five (or six) stamens, very short filaments, and five (or three) leaflets. Prior descriptions of *S. vitiensis* have indicated the stamens as ten or twelve, but flowers are now at hand with 13, 14, and 15 stamens.





FIGURE 22. *Storckiella vitiensis*, from DA 11793; A, flower with 3 sepals, 3 petals, and 2 stamens removed (of 15 stamens in this flower), $\times 4$; B, gynoecium and a few stamens, showing infilled hypanthium, $\times 4$; C, anthers, introrse and extrorse surfaces, $\times 8$.

1. *Storckiella vitiensis* Seem. in Bonplandia 9: 255, nom. nud. 1861, in op. cit. 9: 363. t. 6. (December) 1861; A. Gray in op. cit. 10: 35. 1862, in Proc. Amer. Acad. Arts 5: 317. 1862; Seem. Viti, 435. 1862, Fl. Vit. 68. pl. 13. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 158. 1890; A. C. Sm. in J. Arnold Arb. 36: 279. 1955; J. W. Parham, Pl. Fiji Isl. 66. fig. 29. 1964, ed. 2. 102. fig. 30. 1972.

FIGURES 21, 22.

A tree 6–27 m. high, with a trunk up to 1 m. in diameter, occurring in usually dense forest from near sea level to an elevation of about 300 m. The leaves have 5 or 6 pairs of alternate leaflets in addition to the terminal one, each thin-coriaceous, ovate-oblong to narrowly elliptic, 4–8 \times 1.5–3 cm., acuminate to cuspidate at apex, and paler beneath than above. The fragrant flowers have the calyx green, the petals golden-yellow, and the stamens somewhat darker yellow. As far as material is dated, flowers have been obtained in December, May, and July, and fruits in November and January.

LECTOTYPIFICATION: In his first valid publication of the genus and species, Seemann (December, 1861) cited two collections. It is obvious that his own collection was the principal basis, and therefore I lectotypify his concept by the three κ sheets taken together: Seemann 133 (κ LECTOTYPE, 3 sheets; ISOLECTOTYPE at BM), the flowering

FIGURE 21. *Storckiella vitiensis*; A, fruit with wing at left, $\times 1$; B, inflorescence, $\times 1/3$; C, distal portion of branchlet with foliage, $\times 1/3$; D, inner surface of fruit valve with one attached seed, $\times 1$. A & D from DF 1124, B & C from DA 11793.

material collected in July, 1860, at Port Kinnaird, Ovalau, the fruits collected in November, 1860, presumably from the same locality or possibly from the same tree. Seemann (1865) remarked that he had collected ripe fruit during the very last hours of his stay in Fiji (he sailed from Ovalau on Nov. 16, 1860). The second collection is *Milne* 72 (κ, 2 sheets, leaves and flowers), labelled: "Naviti Levu. Tree forest districts around Nisana 30 to 40 feet high. Milne 1858." Nisana has not been located, but in considering the type locality of *Elaeocarpus milnei* (cf. this *Flora*, vol. 2, p. 362) I speculated that it might be in the Waindina Valley, a very likely locality for the present species. Milne's collection was doubtless made in 1856, not 1858.

DISTRIBUTION: Endemic to Fiji and now known from four of the high islands. Guillaumin (Fl. Nouv.-Caléd. 156. 1948) listed *Storckiella vitiensis* from New Caledonia, in reference to specimens with ten stamens (although the number is not so definite, as noted above); cf. also Guillaumin in Bull. Mus. Hist. Nat. (Paris) 17: 454. 1911; Däniker in Viert. Naturf. Ges. Zürich 77: Beibl. 19: 179. 1932; Guillaumin & Baumann-Bodenheim in Mém. Mus. Nat. Hist. Nat., Sér. B, Bot. 8: 57. 1957. It seems likely that the New Caledonian specimens with more than five stamens represent an undescribed species (cf. Guillaumin's 1911 remarks) rather than *S. vitiensis*.

LOCAL NAMES AND USES: The names *marasa* and *vesida* have been recorded several times, *ngandi* only from the Rewa delta. The species produces a very durable timber that Seemann reported as used for housebuilding, but it is probably too infrequent to be used commercially.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Forest Reserve, Tholo-i-suva, *DA* 2510; vicinity of Tholo-i-suva, *DA* 11793, 11887. REWA: Vicinity of Lomanikoro, Rewa River delta, *DA* 4036. KANDAVU: Vicinity of Naikorokoro, *DF* 1124 (*B. Batiratu* 5). VANUA LEVU: THAKAUNDOVE: Nakatei Creek (tributary of Wairikihake River, which enters Lambasa River about 12 km. south of Lambasa, *DA* 13749 (*DF* 243, *Bola* 91); Navonu Creek, Natewa Peninsula, *Berry* 7, *Howard* 212. FIJI without further locality, *DA* 4035, 4037.

This spectacularly beautiful tree must be considered one of Seemann's most satisfactory finds. Until recent years it had been known only from the two original collections, and in fact it is still rare, although it may be seen in some local abundance around Tholo-i-suva, a short distance north of Suva. The last two numbers cited above, without locality, may have come, with *DA* 4036, from the Rewa delta, but early *DA* numbers are not always sequential as to locality.

8. CASSIA L. Sp. Pl. 376, p. p. minore. 1753; Irwin & Barneby in Mem. New York Bot. Gard. 35: 4. 1982.

Cassia sect. *Fistula* DC. ex Colladon, Hist. Nat. Méd. Casses, 83, nom. superfl. 1816.

Cassia subgen. *Fistula* Benth. in Mart. Fl. Bras. 15 (2): 83, nom. superfl. 1870.

Cassia subgen. *Cassia*; de Wit in Webbia 11: 202. 1955.

Trees, without extrafloral nectaries; leaves spirally arranged or distichous, paripinnate, the leaflets opposite; inflorescences racemose, axillary or borne on branches, many-flowered, the pedicels subtended by a bract and with 2 bracteoles at or shortly above base; flowers ♂, with a solid, turbinate to vase-shaped hypanthium; sepals 5, imbricate, reflexed at anthesis; petals 5, subisomorphic, yellow to red, the vexillar one interior in bud; stamens 10, strongly accrescent toward abaxial side of flower, the filaments 2-many times as long as anthers, those of the 3 long abaxial stamens sigmoidally arcuate and much longer than anthers, those of the other stamens straight, the anthers of abaxial stamens dorsifixed, subversatile, introrsely dehiscent by slits, the anthers of adaxial stamens dehiscent by basal pores; ovary centric; fruit elongate, terete to compressed-tetragonal, sometimes sulcate along sutures or compressed but

turgid, indehiscent, the valves firmly papery, leathery, or ligneous, the cavity divided by transverse septa into 1 rank or in addition by a longitudinal septum into 2 ranks of 1-seeded locules, the seed funicle filiform, the seeds horizontal, somewhat compressed parallel to septa, embedded in wet pulp or fibrous pith, the testa smooth, without areoles.

LECTOTYPE SPECIES: *Cassia fistula* L. (vide Gaertner, *Fruct. Sem. Pl.* 2: 313. *t.* 147, *fig. 1.* 1791; Britton & Brown, *Fl. N. U. S.* ed. 2: 2: 335. 1913), one of the 26 original species of Linnaeus.

DISTRIBUTION: Circumtropical (America, Africa, Madagascar, Asia, Malesia, and Australia), with about 30 species, many of which are widely cultivated ornamentally in nonindigenous areas. Five such species are known to be grown in Fiji.

USEFUL TREATMENTS OF GENUS: WIT, H. C. D. DE. A revision of the genus "Cassia" (Caesalp.) as occurring in Malaysia. *Webbia* 11: 197-292. 1955. SYMON, D. E. A revision of the genus *Cassia* L. Caesalpinaceae in Australia. *Trans. & Proc. Roy. Soc. South Australia* 90: 73-146. 1966. IRWIN, H. S., & R. C. BARNEBY. The American Cassiinae: a synoptical revision of Leguminosae tribe Cassieae subtribe Cassiinae in the New World. *Mem. New York Bot. Gard.* 35: 1-918. 1982.

The thorough and detailed 1982 work of Irwin and Barneby puts into effect, at least for native American species and for most of the widely cultivated ornamentals and weedy adventives, the division of the unwieldy genus *Cassia* into three well-demarcated genera, as advocated by the same authors in *Adv. Leg. Syst.* 104-106. 1981. These taxa, recognized as clearly distinct subgenera by Bentham (in *Trans. Linn. Soc.* 27: 503-591. 1871) and many other specialists, differ from one another in characters as numerous and substantial as those utilized to recognize genera throughout the Fabaceae sensu lato. In the present work I have borrowed freely from the thoroughly documented work of Irwin and Barneby.

KEY TO SPECIES

Leaves with 2-7 (-8) pairs of leaflets; stipules small, 0.5-2 mm. long, caducous before expansion of associated leaf; inflorescences pendulous, the bracts small, up to 5 mm. long, caducous as pedicels begin to elongate.

Inflorescences 15-65 cm. long, the flowers (7-) 15-75; pedicels 3-6 cm. long; petals clear golden-yellow, drying delicately brown-veined, the largest ones 16-) 21-32 mm. long; sigmoid filaments of 3 long stamens gradually and slightly thickened in middle; pods narrowly terete, 30-60 cm. long, 1.5-2.5 cm. in diameter, smooth, the sutures thickened and fully immersed, the fertile locules about 5 mm. long, the seeds embedded in sweet, glutinous, blackish pulp; leaflets 3-7 (-8) pairs, the blades subsymmetrically ovate, usually 9.5-21 × 5-9 cm., acute to subacuminate at apex. 1. *C. fistula*

Inflorescences 7-30 cm. long, the flowers 6-12; pedicels 2-3 cm. long; petals yellow, orange, reddish, or brownish, the largest ones 10-13 mm. long; sigmoid filaments of 3 long stamens abruptly and conspicuously swollen into a globular nodule in middle; pods slightly or markedly compressed, 20-45 cm. long, 1-2.5 cm. broad, with more or less distinct transverse ribs, the sutures persistent as body of pod disintegrates, the seeds falling enclosed in pod partitions about 12 × 10 mm.; leaflets 2-4 (-6) pairs, the blades narrowly ovate to oblong-lanceolate, the larger ones 4.5-5 × 1.5-2 cm., obtuse to emarginate at apex. 2. *C. brewsteri*

Leaves with 8-17 (-21) pairs of leaflets, these with blades seldom exceeding 8 × 3 cm.; petals opening pink or red or whitish, fading to shades of orange or pale yellow or cream-colored.

Stipules deltoid-subulate, to 1 mm. long and usually concealed by indument, caducous before expansion of associated leaf; leaflet blades oblong, the largest ones usually 3.5-6.5 × 1.2-2.5 cm., obtuse at apex; inflorescences becoming obliquely geotropic from drooping branchlets, (8-) 10-23 (-27) cm. long, the flowers usually 20-45, the bracts ovate, 2-5 mm. long, caducous as pedicels begin to elongate; pedicels (8-) 10-20 mm. long; longest petals (8.5-) 9-11 mm. long; sigmoid filaments of 3 long stamens gradually and slightly thickened in middle; pods massively linear-oblong, slightly laterally compressed, 40-60 (-100) cm. long, 3.5-5 cm. broad, keeled dorsally by 1 and ventrally by 2 parallel, blunt ribs, the seeds 14-16 × 9-10 mm. 3. *C. grandis*

Stipules 2-lobed, reniform or crescentic, foliaceous or moderately dilated, laterally attached and 2-10 mm. broad at point of attachment, briefly persistent but absent from mature specimens; leaflet blades ovate to oblong; inflorescences comparatively stiff, simply or paniculately racemose and subcorym-

bose, not (or rarely) drooping, 3-12 (-25) cm. long, the flowers 10-many, the bracts broadly to narrowly ovate-acuminate, 5-12 (-17) mm. long, persistent into anthesis with similar but shorter bracteoles; pods elongate-pipelike, terete or slightly obcompressed, 40-60 cm. long, 1.5-2 cm. broad, neither thickened nor prominent at sutures, the seeds 6.5-8 × 6-7 mm.

Leaflet blades usually 3.5-8 × 1.5-3 cm., obtuse to acute to slightly acuminate at apex; pedicels (2.5-) 3-6 cm. long; petals usually 12-35 mm. long; sigmoid filaments of 3 long stamens abruptly dilated near middle into a globular or ellipsoid nodule, their anthers pilosulous or puberulent dorsally.

4. *C. javanica*

Leaflet blades usually 2-4 × 1-2 cm., obtuse to retuse at apex; blades of stipules falcate-reniform, up to 8 mm. long; pedicels 1-2 cm. long; petals usually 10-14 mm. long; sigmoid filaments of 3 long stamens not dilated, their anthers glabrous. 5. *C. roxburghii*

1. *Cassia fistula* L. Sp. Pl. 377. 1753; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 113. 1939; Yuncker in Bishop Mus. Bull. 178: 60. 1943; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 90. 1948; de Wit in Webbia 11: 207. 1955; J. W. Parham in Agr. J. Dept. Agr. Fiji 29: 32. 1959, Pl. Fiji Isl. 63. 1964, ed. 2. 97. 1972; Symon in Trans. & Proc. Roy. Soc. South Australia 90: 79. 1966; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 50, 64. 1967; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 55. 1970; Verdcourt, Man. New Guinea Leg. 41. fig. 9. 1979; Irwin & Barneby in Mem. New York Bot. Gard. 35: 14. fig. 2. 1982.

This favorite ornamental *Cassia* is a tree with a short bole and spreading crown, cultivated near sea level and usually attaining a height of about 10 m. (up to 20 m. where indigenous). It is unmistakable in its comparatively large leaflets, its pendulous, elongate racemes often occurring two or three together, its strikingly large flowers with long pedicels and golden-yellow petals, and its hanging, terete, smooth, hard-walled pods.

TYPIFICATION: The species is appropriately typified by *Hermann s. n.* (BM LECTOTYPE), collected in Ceylon (cf. Fawcett & Rendle, Fl. Jam. 4 (2): 102. 1920).

DISTRIBUTION: Indigenous in southeastern Asia and early dispersed throughout the Indian subcontinent, introduced into the neotropics prior to 1800, and now extensively cultivated throughout warm countries. It may have been first introduced into Fiji by J. B. Thurston, who listed it in his 1886 *Catalogue*. It may be seen in the Suva Botanical Gardens.

LOCAL NAMES AND USES: *Golden shower*; *Indian laburnum*; *amaltas* (Hindi). The golden shower, a highly ornamental street tree, is much more frequent in Fijian towns and gardens than indicated by the collections at hand. The bark can be used for tanning. Probably seeds are not produced in Fiji.

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Suva, Rodwell Road near Department of Agriculture compound, DA 12243. VANUA LEVU: MATHUATA: Lambasa airport, Howard 307.

2. *Cassia brewsteri* (F. v. Muell.) Benth. Fl. Austral. 2: 282. 1864; W. D. Francis, Austral. Rain-For. Trees, ed. 2. 164. 1951; de Wit in Webbia 11: 290. 1955; Symon in Trans. & Proc. Roy. Soc. South Australia 90: 80. 1966; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 49. 1967.

Cathartocarpus brewsteri F. v. Muell. Ann. Rep. Govern. Bot. (Melbourne) 1858: 17, nom. nud. 1858, Fragm. Phytogr. Austral. 1: 110. 1859.

An infrequently cultivated tree at low elevation in Fiji, attaining a height of about 12 m. and with a pendulous, comparatively few-flowered raceme of yellowish flowers.

TYPIFICATION: The type is *Mueller s. n.* (K HOLOTYPE? ISOTYPE at P), collected in hilly pastures and on banks of the Burdekin River, Queensland.

DISTRIBUTION: Queensland, Australia, occasionally cultivated elsewhere.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Forest Reserve, Tholo-i-suva, DA, May 12, 1942.

3. *Cassia grandis* L. f. Suppl. Pl. 230. 1782; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 90. 1948; de Wit in Webbia 11: 212. 1955; J. W. Parham in Agr. J. Dept. Agr. Fiji 29: 32. 1959, Pl. Fiji Isl. 63. 1964, ed. 2. 97. 1972; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 49. 1967; Verdcourt, Man. New Guinea Leg. 45. fig. 10. 1979; Irwin & Barneby in Mem. New York Bot. Gard. 35: 30. fig. 1. 1982.

In Fiji *Cassia grandis* is occasionally cultivated near sea level as an attractive tree to about 9 m. high (to 15 m. or more where indigenous). The leaves and inflorescences bear a more or less persistent rusty indument, the numerous leaflets are oblong, and the petals open pink or white, soon fading to an orange-pink or pale yellow. The only available collection was flowering in October.

TYPIFICATION: Linnaeus listed a collection made in Surinam in 1754 or 1755 by C. G. Dahlberg, designated as the lectotype by de Wit (1955, cited above). However, Irwin and Barneby (1982) suggest that the species was in part based on a better LECTOTYPE: *Cassia fistula flore incarnato* Breyne, Exot. Pl. Cent. 58. t. 21. 1678.

DISTRIBUTION: An aboriginally dispersed species presumably indigenous in Central America, South America southward to the lower Amazon, and in parts of the Greater Antilles, now widely cultivated throughout tropical areas. In spite of the paucity of Fijian collections, the species is not infrequent and may have been introduced by J. B. Thurston, who listed it in his 1886 *Catalogue*. It was growing in the Suva Botanical Gardens at least until 1959, although no voucher for that record is available.

LOCAL NAMES AND USE: The *pink shower* or *horse cassia* is a striking ornamental for gardens and streets.

AVAILABLE COLLECTION: VITI LEVU: REWA: Suva, Rodwell Road near Department of Agriculture compound, DA 12238.

4. *Cassia javanica* L. Sp. Pl. 379. 1753; Verdcourt, Man. New Guinea Leg. 47. 1979; Irwin & Barneby in Mem. New York Bot. Gard. 35: 46. 1982.

As seen in Fiji, *Cassia javanica* is a handsome ornamental tree cultivated at low elevations and attaining a height of 12 m. (up to 25 m. or more where indigenous). It is characterized by 2-lobed (but evanescent) stipules, numerous leaflets, comparatively stiff inflorescences with persistent bracts, large, long-pedicellate flowers with pink or carmine petals fading to buff-pink or orange or white, and essentially terete pods with the sutures neither thickened nor prominent. Specimens of the two varieties grown in Fiji usually flower between October and March.

Irwin and Barneby (1982, pp. 48-49) have well discussed the problems in recognizing meaningful taxa in *Cassia javanica* (including *C. nodosa*), concluding that the stipules (unfortunately early caducous), sepal size, and size of fertile anthers provide the only dependable characters for sorting material into four varieties, two of which are noted in Fiji.

DISTRIBUTION: Believed to be indigenous in southeastern Asia (Bay of Bengal to southern China and southward) into Malasia including New Guinea, but in cultivation for a long period beyond this area.

KEY TO VARIETIES

- Blades of stipules amply foliaceous, venulose, at least 1 cm. long from tip to tip of lobes and at least 1/3 as broad; leaflets usually rounded to broadly obtuse at apex; rachis of inflorescence stout; sepals dark red, (6.5-) 7-10 mm. long; petals pink, turning dark red. 4a. var. *javanica*
 Blades of stipules crescentic, up to 18 mm. long but not more than 5 mm. broad; leaflets usually acute to narrowly obtuse at apex; rachis of inflorescence slender; sepals green, 5.5-7 mm. long; petals pink to nearly white, turning yellowish pink. 4b. var. *indochnensis*

4a. *Cassia javanica* var. *javanica*; Irwin & Barneby in Mem. New York Bot. Gard. 35: 50. 1982.

Cassia javanica L. Sp. Pl. 379. 1753; de Wit in Webbia 11: 214. 1955; Yuncker in Bishop Mus. Bull. 220: 135. 1959; J. W. Parham, Pl. Fiji Isl. 63. 1964, ed. 2. 98. 1972; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 49. 1967.

Cassia javanica subsp. *javanica*; Verdcourt, Man. New Guinea Leg. 47. 1979.

TYPIFICATION: *Cassia javanica* is based entirely on *Cassia fistula javanica*, *flore carneo* J. Commelijn, Horti Med. Amstelod. 1: 217. t. 111. 1697.

LOCAL NAME AND USE: Usually known as *pink and white shower*, this beautiful ornamental was introduced into Fiji in 1910 (Parham, 1964, 1972, cited above); presumably Yeoward then had it in cultivation at the "Botanical Station," now the Suva Botanical Gardens, although no recent voucher from the Gardens is at hand.

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Government House gardens, Suva, DA L 11532; Suva, Department of Agriculture compound, DA 16204; Suva, in private garden, DA 16782. FIJI without further locality, *Yeoward s. n.* (κ, probably from the present Suva Botanical Gardens).

4b. *Cassia javanica* var. *indochinensis* Gagnepain in Fl. Indo-Chine 2: 158. 1913; Irwin & Barneby in Mem. New York Bot. Gard. 35: 50. fig. 2. 1982.

Cassia nodosa Buch.-Ham. ex Roxb. Fl. Ind. ed. 2. 2: 336. 1832; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 90. 1948; de Wit in Webbia 11: 223. 1955; J. W. Parham, Pl. Fiji Isl. 63. 1964, ed. 2. 98. 1972; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 49. 1967.

Cassia javanica subsp. *nodosa* K. & S. Larsen in Nat. Hist. Bull. Siam Soc. 25: 205. 1974; Verdcourt, Man. New Guinea Leg. 48. 1979.

TYPIFICATION AND NOMENCLATURE: *Cassia nodosa* was described from a plant growing at the Botanic Garden in Calcutta, said to have come originally from Chittagong, Bangladesh, of which authentic specimens are *Wallich 5331* (κ HOLOTYPE; ISOTYPE at NY). The close similarity of *C. nodosa* to *C. javanica* has long been recognized and they are sometimes taken as subspecies. The oldest applicable trinomial is *C. javanica* var. *indochinensis*; Gagnepain cited 13 collections from southeastern Asia for his variety, but a lectotype has presumably not been indicated.

LOCAL NAME AND USE: The ornamental *pink shower* is commonly grown in Fiji and was probably introduced by J. B. Thurston, who listed it as *Cassia nodosa* in his 1886 *Catalogue*. Although the plant was growing in the Suva Botanical Gardens in 1948 (Parham, cited above), the record there is not supported by a voucher.

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Government House gardens, Suva, DA L 11531; Suva, Edinburgh Drive, DA 17236.

5. *Cassia roxburghii* DC. Prodr. 2: 489. 1825; de Wit in Webbia 11: 226. 1955; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 49. 1967; Irwin & Barneby in Mem. New York Bot. Gard. 35: 51. 1982.

Cassia marginata Roxb. Hort. Beng. 31, nom. nud. 1814, Fl. Ind. ed. 2. 2: 338. 1832; J. W. Parham, Pl. Fiji Isl. ed. 2. 98. 1972; non Willd. (1809).

A spreading tree 4-12 m. high, cultivated near sea level, resembling *Cassia javanica* but with smaller leaflets, shorter pedicels, and smaller flowers, of which the petals are pink or orange. Flowers have been collected between October and April.

TYPIFICATION AND NOMENCLATURE: *Cassia marginata* Roxb., an illegitimate later homonym of *C. marginata* Willd., was said to be a native of Ceylon introduced into the Botanic Garden at Calcutta by General Macdowell in 1802; the type (de Wit, 1955, p. 227) is *Wallich 5308* (κ HOLOTYPE). *Cassia roxburghii* is a legitimate substitute name for Roxburgh's taxon (and also has nomenclatural priority).

DISTRIBUTION: Southern India and Ceylon, now widely introduced and cultivated elsewhere.

USE: No local name has been noted in Fiji for this attractive ornamental, which is perhaps less commonly cultivated than *Cassia javanica*. The time of its introduction has not been noted but is probably comparatively recent.

AVAILABLE COLLECTIONS: VITI LEVU: SERUA: NAVUA, Coronation Triangle, DA 16707. NAITASIRI: Nasinu, Experimental Farm, DA 2546. REWA: Suva, Government Buildings garden, DA 16479; Suva, Rodwell Road near Department of Agriculture compound, DA 12239.

9. SENNA Mill. Gard. Dict. Abridg. ed. 4. 1754; Irwin & Barneby in Mem. New York Bot. Gard. 35: 64. 1982.

Cassia sect. *Senna* DC. ex Colladon, Hist. Nat. Méd. Casses, 92. 1816.

Cassia subgen. *Senna* Benth. in Mart. Fl. Bras. 15(2): 96. 1870, in Trans. Linn. Soc. 27: 513, 518. 1871; de Wit in Webbia 11: 228. 1955.

Trees, shrubs, or herbs, often with extrafloral nectaries on leaf petioles or rachises and/or raceme axes; leaves spirally arranged, paripinnate, the leaflets opposite; inflorescences 1-many-flowered, racemose or corymbose-paniculate toward ends of branchlets or rarely borne on branches, the pedicels without bracteoles; flowers ♂, with a solid to slenderly vase-shaped hypanthium; sepals 5, imbricate; petals 5, subisomorphic to strongly heteromorphic, yellow (rarely white), the vexillar one interior in bud; androecium functionally 4-10-merous, the stamens accrescent toward abaxial side of flower, the adaxial ones dwindling to staminodes, the filaments straight, shorter than or not more than twice as long as anthers, the anthers basifixed, glabrous along lateral sutures, dehiscent by pores or short slits apically; fruit terete, 4-angulate, or plano-compressed, sometimes winged lengthwise along sutures or valves, indehiscent or tardily dehiscent along ventral or both sutures, sometimes fragmenting through interseminal septa, the valves papery to coriaceous or ligneous, never coiling, the cavity often transversely septate, the seed funicle filiform, the seeds 1- or rarely 2-seriate, oriented either transversely or basipetally, the testa not pitted, sometimes with well-defined areoles.

TYPE SPECIES: Miller took his generic name from *Senna alexandrina sive foliis acutis* C. Bauhin, Pinax, 397. 1623 = *Senna alexandrina* Mill. Gard. Dict. ed. 8. 1768 (*Cassia senna* L., p. p., excl. var. β).

DISTRIBUTION: Pantropical, extending into warm temperate and rarely into cool temperate areas of both hemispheres, with about 260 species. The greater number of species is American, but others are indigenous in Africa, Madagascar, and Australia, and a few in southeastern Asia and the Pacific. Many species are cultivated as ornamentals and some may be regarded as weeds. Thirteen species are here recorded as occurring in Fiji, one or two of them indigenous, the others either introduced as ornamentals (and sometimes naturalizing) or adventive weeds.

USEFUL TREATMENTS OF GENUS: As listed under *Cassia*.

Four of the sections recognized by Irwin and Barneby (1982) are found in Fiji and are listed parenthetically in the following key, but the key statements refer only to our representatives and do not presume to describe the full variation within the sections.

KEY TO SPECIES

Fertile stamens 10, the anthers similar but slightly accrescent toward abaxial side of flower; leaves with stipitate interpetiolar glands at least between lowermost pairs of leaflets; pods plano-compressed, the seeds transverse, compressed parallel to valves (sect. *Psilorhagma*).

Leaflets 4-6 (-7) pairs; innermost sepal 8-11.5 mm. long; longest petal (20-) 23-30 mm. long; style 4-6.5 mm. long; body of pod 10-17 (-20) cm. long, 1.3-1.8 cm. broad; cultivated only. . . . 1. *S. sulfurea*

Leaflets (3-) 4 (-5) pairs; innermost sepal 5-8 mm. long; longest petal 6-13 mm. long; style 1-2 mm. long; body of pod 6-13 cm. long, 0.8-1.5 cm. broad; indigenous. 2. *S. glanduligera*

Fertile stamens usually 7, rarely reduced to 6 (or fewer); staminodes 3 (infrequently suppressed); pods various (plano-compressed to terete or angled).

Flowers exactly zygomorphic or, if petals randomly asymmetrical, then the pistil centric (not laterally displaced), one abaxial petal not obviously different from the others; foliar glands present or absent; leaflets (in our representatives) 2-18 pairs.

Two long (antepetalous) abaxial stamens incurved together in a plane opposed to vexillar petal, divergent from one another at a narrow angle or continuously subparallel; floral bracts comparatively inconspicuous, linear or lanceolate to ovate, seldom longer than 12 mm.; foliar glands present (lacking only in sp. no. 3); leaflets 2-12 (-14) pairs; stipules subulate or lanceolate to deltoid, rarely exceeding 12×5 mm. (sect. *Chamaefistula*).

Foliar glands absent; tree 6-12 m. high; leaves to 30 cm. long or more, the leaflets 5-12 (-14) pairs; functional stamens 7 but 3 staminodes relatively large; cultivated and sparingly naturalized.

3. *S. siamea*

Foliar gland(s) present, either between or below the proximal pair(s) of leaflets.

Gland(s) inserted between pairs of leaflets or slightly above them.

Anthers of 2 or 3 fertile abaxial stamens distinctly beaked, the beak more or less perfectly incurved and its orifice oblique; leaflets 2 or 3 pairs.

Shrub or tree (1.5-) 2-8 m. high; leaflets always 2 pairs, the gland 1 between proximal pair, sessile, ovoid-ellipsoid, obtuse, usually 2-4 mm. long; functional stamens 6 or 7; pod cylindrical or obtusely 4-angular, usually 14-36 cm. long; sparingly cultivated.

4. *S. bacillaris*

Coarse herb or shrub 0.2-1.2 (-2) m. high, with glabrescent stems; leaves usually 6-12 cm. long, the leaflets 3 pairs, the rachis with slender, cylindrical glands about 2 mm. long between both lower pairs of leaflets, the leaflet blades obovate, broadly rounded at apex, the largest (distal) ones $2.5-5.5 \times 1.5-3$ cm.; functional stamens 7; pod often curved, slender (4-6 mm. in diameter), terete or 4-angled, 10-15 cm. long; foetid-smelling weed, often abundant. 5. *S. tora*

Anthers of 2 or 3 fertile abaxial stamens with a short, dilated, obliquely truncate beak; leaflets 3 or 4 (-5) pairs, with glands present between all (or all but distal) pairs; leafy shrub or small tree 1-5 m. high; largest leaflet blades ovate, up to 10×4 cm., acuminate; cultivated and also becoming naturalized. 6. *S. septemtrionalis*

Gland inserted on petiole below proximal pair of leaflets, often contiguous to leaf pulvinus; coarse herbs or shrubs seldom exceeding 2 m. in height; leaflets 3-8 pairs.

Stems and leaves hirsute with straight, ascending, pale, lustrous hairs 1-2.5 mm. long; petiolar gland subcylindric to subclavate; peduncles usually 1-12 mm. long, the racemes 2-8-flowered; pod $11-18 \times 0.4-0.7$ cm., densely hirsute, the seeds when not crowded compressed parallel to valves, when crowded becoming variably distorted; adventive weed.

7. *S. hirsuta*

Stems, leaves, and pods soon glabrate, if at first pilosulous the longest hairs not more than 0.6 mm. long; pods 6-13 \times 0.7-1 cm., the seeds mostly with broad faces turned to septa.

Petiolar gland hemispherical, ovoid, or subglobose; leaflets 4 or 5, the largest blades up to 12×4 cm.; peduncles 3-8 mm. long, the racemes 1-5-flowered, the bracts acute; style moderately dilated or incurved at tip, the stigmatic cavity introrsely lateral, elliptic-oblongate; pod compressed or plano-compressed, the seeds 1-seriate; adventive weed, often locally abundant. 8. *S. occidentalis*

Petiolar gland cylindrical or clavate; leaflets (4-) 6-8, the largest blades up to 7×2 cm.; peduncles 8-25 mm. long, the racemes 4-10-flowered, the bracts obtuse to subacute; style strongly dilated at tip and incurved through about 180° , the stigmatic cavity terminal, round; pod subterete, the seeds 2-seriate; presumably indigenous but infrequent.

9. *S. sophera*

Two long (structurally antepetalous) abaxial stamens raised sideways into the plane horizontal to floral axis of symmetry, the incurved anthers opposed to one another like the arms of tongs; floral bracts conspicuous, petaloid, 9-30 mm. long, forming a terminal cone on developing racemes; foliar glands lacking; leaflets 5-18 pairs; dense-foliaged shrubs or small trees usually not more than 5 m. high (sect. *Senna*).

Leaves usually 30-75 cm. long, the terminal seta of rachis dilated into a conduplicate blade 2.5-5 mm. long, the leaflets 5-13 pairs, the larger blades usually $7-19 \times 3-10$ cm.; stipules obliquely deltoid, $6-16 \times 3-10$ mm.; floral bracts yellow or orange; pods 12-19 cm. long, winged lengthwise down the middle of each valve; cultivated or sparingly naturalized. 10. *S. alata*

Leaves usually 10-40 cm. long, the terminal seta of rachis obsolete, the leaflets 8-18 pairs, the larger blades usually $2-6.5 \times 1-2.5$ cm.; stipules broadly ovate-cordate, acuminate, $10-25 \times 8-12$ mm.; floral bracts brownish or blackish green; pods 7-12 cm. long, strongly compressed; sparingly cultivated. 11. *S. didymobotrya*

Flowers strongly asymmetrical, one abaxial petal (alternately right and left following raceme axis) obliquely dilated and opposed to the laterally displaced pistil; foliar gland(s) present at least between

proximal pair of leaflets; leaflets (in our representatives) usually 4–36 pairs, the blades not larger than 4.6×1.5 cm. (sect. *Peiranisia*).

Leaflets (in our variety) 16–36 (–46) pairs, the blades oblong to oblong-elliptic, usually 20–46 \times 4.5–13 mm.; foliar gland present between proximal pair of leaflets and similar glands often present also between a few distal pairs; inflorescence a panicle of 3–16 racemes, each raceme usually with 5 or more flowers; pedicels 14–32 mm. long, not subtended by a gland; longest petals 16–26 mm. long; pod broadly linear, 8–20 \times 1.3–2.1 cm.; tree to 11 (–25) m. high, cultivated and perhaps sparingly naturalized. 12. *S. multijuga*

Leaflets (in our variety) usually 4–7 pairs, the distal blades obovate to oblanceolate, usually 19–35 \times 8–15 mm.; foliar gland present only between proximal pair of leaflets; inflorescence inconspicuously paniculate, composed of 1–few racemes, each raceme usually 2-flowered; pedicels 11–18 mm. long, each subtended on one side by a gland like that between proximal pair of leaflets; longest petals 14–19 mm. long; pod linear, in our variety 6–9.5 \times 0.4–0.5 cm.; shrub to 4 m. high, sparingly cultivated. 13. *S. pallida*

I. *Senna sulfurea* (DC. ex Colladon) Irwin & Barneby in Mem. New York Bot. Gard. 35: 78. 1982.

Cassia glauca Lam. Encyl. Méth. Bot. 1: 647. 1785; J. W. Parham, Pl. Fiji Isl. ed. 2. 97. 1972; non *Senna glauca* Roxb. (1832).

Cassia sulfurea DC. ex Colladon, Hist. Nat. Méd. Casses, 84. 1816.

Cassia surattensis sensu de Wit in Webbia 11: 269. 1955; non Burm. f. (1768).

As infrequently seen in cultivation near sea level in Fiji, *Senna sulfurea* is a small tree 4–6 m. high. The leaves, up to 30 cm. in length, have 4–6 (–7) pairs of leaflets with usually elliptic blades paler beneath, the largest ones up to 8.5×3.8 cm. The racemes are mostly 7–15-flowered, with pedicels 2–4 cm. long, and the petals are bright yellow, ovate to oblong-obovate, and as long as 30 mm. Flowers have been noted in Fiji in January and March.

TYPIFICATION AND NOMENCLATURE: The oldest name for this species, *Cassia glauca*, is based on *Sonnerat* (P-LA HOLOTYPE), from the vicinity of Pondichéry, India; the epithet cannot be used in *Senna* because of Roxburgh's use of the binomial for a different taxon. *Cassia sulfurea* is based on a plant growing "in horto Parisiano" in 1803; no specimen of this seems extant, but a specimen at G-DC, said to be from Mauritius or La Réunion, is considered authentic by Irwin and Barneby (1982). The same authors have discussed the confusion between *Cassia glauca* and *C. surattensis*, clarifying the two closely related species of *Senna* sect. *Psilorhagma*, both of which are now widely cultivated.

DISTRIBUTION: Probably indigenous in tropical India and Burma, but early dispersed through Indo-Malesia as a shade and ornamental tree and becoming naturalized, now cultivated in tropical areas in both hemispheres.

USE: An ornamental and shade tree.

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Suva Botanical Gardens, DA 12296; Lami, H. B. R. Parham 9, p. p. (March 22, 1932).

The related *Senna surattensis* (Burm. f.) Irwin & Barneby, with smaller leaves, flowers, and fruits, has not been noted in Fiji but is likely to be found there in cultivation. In the southern Pacific it is known from the Mariana and Caroline Islands (cf. Fosberg in *Phytologia* 15: 500. 1968), the Cook Islands, the Societies, and perhaps elsewhere.

In clarifying past interpretations of the "*Cassia glauca*" complex (i. e. the species now referable to *Senna sulfurea* and *S. surattensis*), Irwin and Barneby (1982, p. 80) made the correct combination *Senna gaudichaudii* (Hook. & Arn.) Irwin & Barneby for the only indigenous Hawaiian relative, suggesting that the taxon of this relationship indigenous in Fiji and the New Hebrides is the Hawaiian species. They did not mention *Cassia glanduligera* St. John, a taxon that in my opinion merits separation at some level from *S. gaudichaudii*; it is discussed as the following species.

2. *Senna glanduligera* (St. John) A. C. Sm., comb. nov.

Cassia glauca sensu A. Gray, Bot. U. S. Expl. Exped. 1: 464. 1854; Seem. Viti, 435. 1862, Fl. Vit. 67, p. p. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 158. 1890; Guillaumin in J. Arnold Arb. 12: 247. 1931; non Lam. *Cassia glanduligera* St. John in Trans. Roy. Soc. New Zealand Bot. 1: 181. fig. 8. 1962.

As seen in Fiji, this indigenous senna occurs as an infrequent shrub or small tree 1-5 m. high growing on rocky coasts or on lagoon cliffs, usually or always on limestone. It becomes glabrous very early and also loses its stipules, these being lanceolate and (5-) 7-12 mm. long. The leaves are 9-22 cm. long, with the longer interfoliolar segments of the rachis (10-) 15-25 mm. long; the leaflets are usually 4 pairs, with conspicuous, clavate glands between the 2 or 3 lowermost pairs, and with elliptic to oblong blades seldom exceeding 7×3.5 cm. The short inflorescences bear fragrant flowers with yellow petals no longer than 13 mm., and the pods are thin, flat, and brown, not exceeding 13×1.5 cm. Dated collections bore flowers and fruits in February and August.

TYPIFICATION: The type of *Cassia glanduligera* is *St. John & Fosberg 15128* (BISH HOLOTYPE and 2 ISOTYPES), collected June 18, 1934, on elevated dissected coral at the north end of Henderson Island.

DISTRIBUTION: New Hebrides (and possibly New Caledonia) eastward to Henderson Island. In addition to the Fijian collections cited below, material is now available from the New Hebrides (Erromango and Tanna, cited by Guillaumin, 1931), Austral Islands (Rurutu and Raivavae), Rapa, and Henderson. In his original discussion of *Cassia glanduligera*, St. John mentioned that reports of *C. gaudichaudii* from Tahiti, the Loyalty Islands, and New Caledonia should be reconsidered. It seems likely that indigenous sennas of this relationship from those areas will prove to represent *Senna glanduligera*.

LOCAL NAME: *Vaivai* (Fulanga).

AVAILABLE COLLECTIONS: OVALAU: *U. S. Expl. Exped. ONEATA: U. S. Expl. Exped. FULANGA: On limestone cliffs in lagoon, Smith 1210. ONGEA LEVU: On rocky sea coast, Bryan 431.*

The relationship between *Senna glanduligera* and *S. gaudichaudii* (Hook. & Arn.) Irwin & Barneby (i. e. *Cassia glanduligera* and *C. gaudichaudii*) is indeed very close, as implied in St. John's protologue. There appear to be no consequential differences between the flowers and fruits of the two taxa, but certain divergent tendencies are apparent if series of collections are carefully compared, these being expressed in the following key:

Young vegetative parts, rachis, petiolules, and lower surfaces of leaflet blades at first copiously stramineous-pilose with spreading hairs, the indument usually persisting at anthesis and often in fruit, but sometimes finally lost; stipules (6-) 8-18 mm. long; leaflets (3-) 5 (-6) pairs, the interpetiolar glands very slenderly stipitate-clavate, present between 1 or 2 lowermost pairs of leaflets, the leaflet blades elliptic-oblong or narrowly elliptic, the largest ones $2.2-6$ (-9.5) \times $(0.7-)$ $1-2.5$ (-3.3) cm., (1.9-) 2-3 (-3.3) times longer than broad; endemic to Hawaii. *S. gaudichaudii*

Young vegetative parts, rachis, petiolules, and lower surfaces of leaflet blades at first sparsely pale- or brown-puberulent with appressed or subsending hairs, the indument evanescent and usually lost before full anthesis; stipules (5-) 7-12 mm. long; leaflets (3-) 4 (-5) pairs, the interpetiolar glands (comparatively stout-stalked) present between 2 or 3 lowermost pairs of leaflets, the leaflet blades elliptic to oblong, the largest ones $(3.4-)$ $4-7$ (-8) \times $(1.3-)$ $1.5-3.7$ cm., (1.6-) 1.8-2.5 (-2.9) times longer than broad; southern Pacific from (New Caledonia?) New Hebrides to Henderson Island.

S. glanduligera

The characters here utilized are not entirely convincing, and certainly some taxonomists (including R. C. Barneby, who has kindly reviewed the opinion here expressed) will consider them to denote taxa of only infraspecific consequence, if indeed even that. However, *Senna gaudichaudii* is the only indigenous Hawaiian senna, and one must be very reluctant to extend the range of an assumed endemic to southern Pacific archipelagoes. Very few flowering plants, except a limited number that are notoriously "easy"

dispersers, have natural ranges that extend north-south between Hawaii and Polynesia-Melanesian archipelagoes. The characters itemized above referring to indument and leaflet blade proportions are at once perceived, although if the two populations were now in a position to exchange genetic data they would possibly lose their identities.

3. *Senna siamea* (Lam.) Irwin & Barneby in Mem. New York Bot. Gard. 35: 98. 1982.

Cassia siamea Lam. Encycl. Méth. Bot. 1: 648. 1785; Benth. in Trans. Linn. Soc. 27: 549. 1871; Greenwood in Proc. Linn. Soc. 154: 94. 1943; de Wit in Webbia 11: 263. 1955; J. W. Parham, Pl. Fiji Isl. 64. 1964, ed. 2. 98. 1972; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 50. 1967; Verdcourt, Man. New Guinea Leg. 52. 1979.

Cassia florida Vahl, Symb. Bot. 3: 57. 1794.

As it occurs in Fiji, *Senna siamea* is a tree 6-12 m. high (up to 30 m. where indigenous), occasionally cultivated between sea level and about 250 m. and sometimes established on roadsides and in parks. Its stipules are subulate, minute, about 1 mm. long, and very early caducous. Its leaves may exceed 30 cm. in length, and its usually 5-12 pairs of leaflets have lanceolate to ovate-elliptic blades up to 8×3 cm. and obtuse to emarginate at apex. The inflorescence is a thyrsiform or pyramidal panicle up to 40 cm. long, composed of corymbiform racemes usually with 20-60 flowers, the pedicels are 20-35 mm. long, the largest sepal is 6-9 mm. long, and the yellow petals are as long as 12-17 mm. The pods are linear-plano-convex, usually $20-30 \times 1.2-1.5$ cm., with thick, riblike sutures, the seeds strongly compressed parallel to valves, up to 8×6 mm. Dated specimens were flowering in March and April.

TIPIFICATION AND NOMENCLATURE: *Cassia siamea* is typified by *Commerson* (P-LA HOLOTYPE), taken from a plant cultivated on La Réunion in the Mascarenes but believed to be indigenous in Burma and Thailand, now extensively cultivated as an ornamental or sometimes as a coffee shade or windbreak. *Cassia florida* was described from the East Indies; Irwin and Barneby (1982) have not seen a type but accept Bentham's traditional interpretation (1871) of it. Other synonyms are discussed by Irwin and Barneby.

DISTRIBUTION: Indigenous in southeastern Asia, probably in Burma and Thailand, now widely cultivated elsewhere. It was probably introduced into Fiji by J. B. Thurston, listed in his 1886 *Catalogue* as *Cassia florida*.

LOCAL NAME AND USE: The *kassod tree* was probably brought into Fiji as an ornamental.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Forest Park, Tholo-i-suva, DF 309, Damanu 32; Tamavua Village, Tothill 140; 9 miles from Suva along King's Road, DA 16408. REWA: Suva, Department of Agriculture compound, DA 12060; Suva, Rodwell Road near Department of Agriculture compound, DA 12358.

4. *Senna bacillaris* (L. f.) Irwin & Barneby in Mem. New York Bot. Gard. 35: 113. 1982.

Cassia bacillaris L. f. Suppl. Pl. 231. 1782.

Cassia fruticosa sensu Benth. in Mart. Fl. Bras. 15 (2): 98. t. 31. 1870, in Trans. Linn. Soc. 27: 521. 1871; de Wit in Webbia 11: 247. 1955; Backer & Bakh. f. Fl. Java 1: 537. 1963; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 70. 1967; J. W. Parham, Pl. Fiji Isl. ed. 2. 97. 1972; Verdcourt, Man. New Guinea Leg. 43. 1979; non Mill. (1768).

A tall shrub or small tree 2-8 m. high, infrequently cultivated near sea level. The leaves are 12-25 cm. long overall, the petiole being 2-6 cm. long and usually exceeding the rachis. *Senna bacillaris* is the only species of the genus recorded from Fiji with as few as two pairs of leaflets, these having inaequilaterally elliptic or ovate blades up to 19×9.5 cm. The paniculate inflorescence is composed of 5-35-flowered racemes usually 2-7 cm. long, the pedicels being 2.5-5 cm. long, the longest sepal 8-12 mm. long, the petals pale yellow or golden-yellow and with obovate or elliptic blades as long as 18-30 mm. The pendulous pods bear biseriata seeds embedded in pulp. The only specimen at hand was flowering in July.

TYPIIFICATION AND NOMENCLATURE: The type of *Cassia bacillaris* is *C. G. Dahlberg* (LINN 528.2 & 3 HOLOTYPE), from Surinam. A discussion of other synonyms and of Bentham's misinterpretation of *Cassia fruticosa* Mill. is provided by Irwin and Barneby.

DISTRIBUTION: Tropical America, widely dispersed around the southern circumference of the Caribbean and in northeastern South America, and long cultivated in tropical gardens of the Old and New Worlds. Of the two varieties treated by Irwin and Barneby, the commonly cultivated plant belongs in var. *bacillaris*.

USE: Ornamental; apparently a comparatively recent introduction into Fiji.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Plant Introduction and Quarantine Station, Nanduloulou, DA 12158.

5. *Senna tora* (L.) Roxb. Fl. Ind. ed. 2. 2: 340. 1832.

Cassia tora L. Sp. Pl. 376. 1753; Christophersen in Bishop Mus. Bull. 128: 99. 1935; A. C. Sm. in Sargentia 1: 39. 1942; Greenwood in Proc. Linn. Soc. 154: 97. 1943; de Wit in Webbia 11: 276. 1955; Brenan in Kew Bull. 13: 248. 1958; Yuncker in Bishop Mus. Bull. 220: 136. 1959; J. W. Parham in Dept. Agr. Fiji Bull. 35: 82. fig. 40. 1959. Pl. Fiji Isl. 64. 1964, ed. 2. 99. 1972; Symon in Trans. & Proc. Roy. Soc. South Australia 90: 92. 1966; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 144. 1972; Verdcourt, Man. New Guinea Leg. 56. 1979.

Cassia obtusifolia sensu Seem. in Bonplandia 9: 255. 1861, Viti, 435. 1862, Fl. Vit. 67. 1865, op. cit. 427. 1873; Drake, Ill. Fl. Ins. Mar. Pac. 158. 1890; non L.

A coarse herb or shrub usually not exceeding 1.2 m. in height, abundantly naturalized as a weed in fields, plantations, canefields, and villages, along roadsides, and also spreading to grass-covered hills and forested ravines at elevations from near sea level to about 600 m. This pernicious weed is at once distinguished from other weedy sennas in Fiji by having its leaflets in three pairs, with a gland between both lower pairs; the leaflet blades are obovate and broadly rounded at apex, the largest (distal) ones being up to 5.5 × 3 cm. The short, 2-flowered racemes have pedicels 4–15 mm. long, sepals 5–6 mm. long, and yellow petals up to 8–10 mm. long. Flowers and fruits occur throughout the year.

TYPIIFICATION: De Wit (1955, cited above) proposed as the type LINN 528.9. However, Brenan (1958, p. 250) pointed out that this specimen was available to Linnaeus only in 1758; a more suitable choice is the original reference to Fl. Zeyl. 152. 1747: Herb. Hermann (BM LECTOTYPE), collected in Ceylon.

DISTRIBUTION: Paleotropical, from India and Ceylon eastward into Polynesia, but not indigenous east of Melanesia and perhaps not there. The species has been confused with *Senna obtusifolia* (L.) Irwin & Barneby (i. e. *Cassia obtusifolia* L.); Brenan (1958, cited above) has pointed out the distinctions between the two species and their different distributions. *Senna obtusifolia* is distributed throughout the tropical regions of the world, but it does not occur in Polynesia (nor, presumably, in most of Melanesia, although Verdcourt (1979) considers it present in New Guinea). Neither of the two species was believed to occur in Australia by Brenan, but Symon (1966) indicates that both are present there as recent adventives. In Fiji *S. tora* is now a widespread weed difficult to eradicate. The date of its introduction is uncertain, but the first record seems to be that of Seemann, who collected it in 1860. Probably it was an early and inadvertent European introduction rather than an aboriginal one. It is also frequent in Tonga and Samoa but seems infrequent or lacking in many other Polynesian archipelagoes. About 50 Fijian collections, most made within the past half century, are at hand, from seven islands, although the species is doubtless present on many other islands.

LOCAL NAMES: *Kaumothe* (general); *pini* (Lakemba); *tarota* (Hindi).

REPRESENTATIVE COLLECTIONS: VITI LEVU: Mba: Lautoka, *Greenwood 206*; Nandi, *DA 9686*: Nalotawa, eastern base of Mt. Evans Range, *Smith 4500*; Vatia, west of Tavua, *Degener 14981*. NANDRONGA & NAVOSA: Singatoka Experimental Farm, *DA 5958*; Lawangga, *DA 9779*. RA: Yanggara, *DA 10732*; Pasture Seed and Production Farm, Ndombulevu, *DA 9525*. TAILEVU: Naingani Island, *DA 3372*; Matavatathou, *DA 11279*. REWA: Lami, *H. B. R. Parham 9*, p. p.; Suva, *Meebold 16462*. KANDAVU: Between Talaulia and Ndavinggele, *DA 2939*. VANUA LEVU: MATHUATA: Tambia, *DA 8745*; Lambasa, *Greenwood 206 B*. THAKAUNDROVE: Savusavu, *Krauss 1021*. TAVEUNI: Vicinity of Waiyevo, *Gillespie 4461.4*; Vatuwiri Estate, *DA 8923*. MATUKU: *Bryan 261*. VANUA MBALAVU: Lomaloma, *DA 10232*. LAKEMBA: Near Tumbou, *Garnock-Jones 896*. FIJI without further locality, *Seemann 135*.

6. *Senna septemtrionalis* (Viv.) Irwin & Barneby in Mem. New York Bot. Gard. 35: 365. 1982.

Cassia septemtrionalis Viv. Elench. Pl. Hort. Bot. 14. 1802.

Cassia laevigata Willd. Enum. Pl. Hort. Berol. 1: 441. 1809; Seem. in Bonplandia 9: 255. 1861, Viti, 435. 1862, Fl. Vit. 67. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 158. 1890; J. W. Parham in Agr. J. Dept. Agr. Fiji 29: 32. 1959, Pl. Fiji Isl. ed. 2. 98. 1972.

Cassia floribunda sensu de Wit in Webbia 11: 245. 1955; J. W. Parham, Pl. Fiji Isl. 63. 1964, ed. 2. 97. 1972; Symon in Trans. & Proc. Roy. Soc. South Australia 90: 86. 1966; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 70. 1967; Verdcourt, Man. New Guinea Leg. 43. 1979; non Cav. (1801) (i. e. *Senna* × *floribunda* (Cav.) Irwin & Barneby in Mem. New York Bot. Gard. 35: 360. 1982; *Senna multiglandulosa* (Jacq.) Irwin & Barneby × *S. septemtrionalis*).

Small tree or shrub 1–5 m. high, flowering almost continually, cultivated near sea level and also naturalized on cleared land and becoming a weed in villages and thickets up to an elevation of 900 m. Its lanceolate stipules are 3–7 mm. long and caducous, and its leaves are 8–25 cm. long, usually with 3 or 4 pairs of leaflets with acuminate blades up to 10 × 4 cm. The inflorescence is a terminal panicle of racemes, these up to 8 cm. long and usually 4–10-flowered. The flowers have bright yellow (sometimes green- or reddish-tinged) sepals up to 6.5–10 mm. long; the petals are bright yellow, the longest ones 13–18 mm. long; and the pods are obliquely ascending, cylindric or obtusely subquadrangular, up to about 10.5 × 1 cm. (flattening under pressure), with valves becoming papery.

TYPEIFICATION AND NOMENCLATURE: *Cassia septemtrionalis* was described from plants cultivated at Genoa; no type is known to survive, but the description is full and decisive. *Cassia laevigata* was described from a plant cultivated at Berlin (B-WILLD 7952 HOLOTYPE), of unknown provenance. For a discussion of these and the hybrid *Senna* × *floribunda*, cf. Irwin and Barneby (1982).

DISTRIBUTION: Apparently indigenous in Mexico and southward to Costa Rica, but a prolific weed and since pre-Columbian times used for folk medicine, more recently widespread in cultivation and naturalized. It has long been established in the Old World tropics, Africa and India to Malesia, and also in Fiji and Hawaii. The date of its introduction into Fiji is unclear, but Seemann noted it (as *Cassia laevigata*) in 1860; it could conceivably have been an aboriginal introduction, but more probably was an early European introduction that occasionally became naturalized.

LOCAL NAMES AND USE: *Mosimosi* (*Gillespie 4080*); *naseni karakarawa* (Mba); *winivinkau* (Namosi); *yellow shower*. An ornamental, but also widely established on Viti Levu as a weed.

AVAILABLE COLLECTIONS: VITI LEVU: Mba: Mountains inland from Lautoka, *Greenwood 24, 24Z*; Nalotawa, eastern base of Mt. Evans Range, *Smith 4113*; Nandala, south of Nandarivatu, *Degener 14735*, base of Mt. Tomanivi, *Parks 20842*. NAMOSI: Vuniwaivutuku, west of Namosi, *Seemann 136*. NAITASIRI: Nanduruloulou (in nursery), *DA 12142*. REWA: Suva, in private garden, *DA 16083*; also recorded as growing in the Suva Botanical Gardens (Parham, 1959) but no voucher available. FIJI without further locality, *Gillespie 4080*.

7. *Senna hirsuta* (L.) Irwin & Barneby in Phytologia 44: 499. 1979, in Mem. New York Bot. Gard. 35: 425. 1982.

Cassia hirsuta L. Sp. Pl. 378. 1753; Greenwood in Proc. Linn. Soc. 154: 97. 1943; de Wit in Webbia 11: 250. 1955; J. W. Parham in Dept. Agr. Fiji Bull. 35: 81. 1959, Pl. Fiji Isl. 63. 1964, ed. 2. 97. 1972; Symon in Trans. & Proc. Roy. Soc. South Australia 90: 88. 1966; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 80. 1967; Verdcourt, Man. New Guinea Leg. 45. 1979.

A coarse herb becoming softly woody in age or a shrub 0.5–3 m. high, established as a weed in villages and plantations, along roadsides, and on rocky shores of rivers. From other weedy sennas occurring in Fiji, *Senna hirsuta* is readily distinguished by its abundant, pale indument. The leaves are usually 10–25 cm. long, with (2–) 3–6 pairs of accrescent leaflets, the distal ones with ovate to elliptic, acuminate blades up to 10.5 × 4 cm. The 2–8-flowered racemes have pedicels 10–25 mm. long at anthesis and yellow petals up to 8–15 mm. long. The pods are stiffly ascending or outwardly recurved, up to 18 cm. long, and very slender. Flowers and fruits have been noted between April and September.

TYPEIFICATION: The type was a plant cultivated at Hartekamp and described by Linnaeus, Hort. Cliff. 159. 1737, represented in Herb. Cliffort. (BM HOLOTYPE) as *Cassia* No. 4 (leaves only).

DISTRIBUTION: A widespread weed but perhaps genuinely autochthonous in South America, most likely in southern Brazil. Seven varieties are recognized by Irwin and Barneby (1982), essentially confined to America except for var. *hirsuta*, which has long been naturalized in the wet tropics of the Old World. It was first noted in Fiji in 1935 (Parham, 1972).

LOCAL NAME: *Stinking cassia*.

AVAILABLE COLLECTIONS: VITI LEVU: Mba: Lautoka, Greenwood 229, 787; Nandi, DA 10892; Vatutu, near Nandi, DA 10890; Veiseisei Village, DA 16659; Nalotawa, eastern base of Mt. Evans Range, Smith 4328. NANDRONGA & NAVOSA: Along Queen's Road west of Thuvu, DA 5826; Ndumbulevu, upper Singatoka Valley, DA 11344; Narata, upper Singatoka Valley, DA 11362. NAITASIRI: Tamavua, DA 2554, 11826. REWA: Suva, Meebold 16656. OVALAU: Valley of Mbureta and Lovoni Rivers, Smith 7389. TAVEUNI: Waimangere Estate, DA 11517.

8. *Senna occidentalis* (L.) Link, Handbuch 2: 140. 1829; Roxb. Fl. Ind. ed. 2. 2: 343. 1832; Irwin & Barneby in Mem. New York Bot. Gard. 35: 436. 1982.

Cassia occidentalis L. Sp. Pl. 377. 1753; Seem. in Bonplandia 9: 255. 1861, Viti, 435. 1862, Fl. Vit. 67. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 158. 1890; Christophersen in Bishop Mus. Bull. 128: 99. 1935; Yuncker in op. cit. 178: 60. 1943; Greenwood in Proc. Linn. Soc. 154: 97. 1943; de Wit in Webbia 11: 256. 1955; Yuncker in Bishop Mus. Bull. 220: 135. 1959; J. W. Parham in Dept. Agr. Fiji Bull. 35: 81. fig. 39. 1959, Pl. Fiji Isl. 64. 1964, ed. 2. 98. 1972; Symon in Trans. & Proc. Roy. Soc. South Australia 90: 87. 1966; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 78. fig. 14. 1967; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 56. 1970; St. John & A. C. Sm. in Pacific Sci. 25: 327. 1971; Verdcourt, Man. New Guinea Leg. 51. 1979.

Coarse, foetid herb or shrub to 2 m. high, often locally abundant as a weed at elevations from near sea level to 850 m. along roadsides, in canefields, coconut plantations, pastures, and open fields, and sometimes on river banks or sand dunes. The larger leaves are 11–24 cm. long, usually with 4 or 5 pairs of distally accrescent leaflets with the largest blades mostly ovate-acuminate and up to 12 × 4 cm. The short, 1–5-flowered racemes have the sepals pinkish- or brown-tinged, the petals yellow and up to 16 mm. long, drying whitish and brown-veined. The erect or narrowly ascending, usually slightly incurved pods are 8–13 × 0.7–1 cm. Flowers and fruits are seen throughout the year.

TYPEIFICATION: The best lectotype (Brenan, 1967, cited above) is from a plant cultivated at Hartekamp and first described by Linnaeus in Hort. Cliffort. 159. 1738; Herb. Cliffort. (BM LECTOTYPE). De Wit (1955) had designated LINN 528.13 as the type, but that specimen was not available to Linnaeus until 1758 (Irwin and Barneby, 1982).

DISTRIBUTION: Although *Senna occidentalis* has long had a pantropical distribution, extending into warm temperate areas, and has often been considered initially

American, Irwin and Barneby (1982, p. 440) adduce that its origin was more probably paleotropical. It was first noted in Fiji by Seemann in 1860. About 40 Fijian collections are at hand from five islands, but the species may be anticipated on many others.

LOCAL NAMES: *Kau mothe; pini* (Lakemba).

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Lautoka, *Tohill* 462; vicinity of Nandi, *DA* 10705; Vatia, west of Tavua, *Degener* 14979; between Nandarivatu and Navai, *DA* 17329. NANDRONGA & NAVOSA: Naveisamasama, *DA* 9760; Ndumbulevu, upper Singatoka Valley, *DA* 11346. RA: Yanggara, *DA* 10737; Penang, *Greenwood* 258A. TAILEVU: Naingani Island, *DA* 3369; Matavatathou, *DA* 9951. REWA: Suva Point, *DA* 6089. OVALAU: Levuka, *Tohill* 134. VANUA LEVU: MATHUATA: Lambasa, *Greenwood* 258C. THAKAUNDOVE: Nangingi, *DA* 10778. TAVEUNI: Vicinity of Waiyevo, *Gillespie* 4664.7; Waitavala Estate, *DA* 8905. LAKEMBA: Near Tumbou, *Garnock-Jones* 894. FIJI without further locality, *Seemann* 134.

9. *Senna sophera* (L.) Roxb. Fl. Ind. ed. 2. 2: 347, as *S. sophora*. 1832; Irwin & Barneby in Mem. New York Bot. Gard. 35: 440. 1982.

Cassia sophera L. Sp. Pl. 379. 1753; Seem. Fl. Vit. 67, as *C. sophora*. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 158. 1890; de Wit in Webbia 11: 265. 1955; Yuncker in Bishop Mus. Bull. 220: 136. 1959; J. W. Parham, Pl. Fiji Isl. 64. 1964, ed. 2. 98. 1972; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 78. 1967; St. John & A. C. Sm. in Pacific Sci. 25: 327. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 51. 1972; Verdcourt, Man. New Guinea Leg. 54. 1979.

Cassia occidentalis var. *sophera* A. Gray, Bot. U. S. Expl. Exped. 1: 462. 1854.

Erect herb 0.5–2 m. high, soon becoming woody, only weakly malodorous, presumably indigenous and occurring near sea level, although weedy in aspect, apparently rare. The larger leaves are 7–18 cm. long, usually with 6–8 pairs of leaflets, the largest (distal) blades lanceolate or ovate-acuminate and up to 7 × 2 cm. The 4–10-flowered racemes have flowers with petals like those of *Senna occidentalis* but slightly smaller. The pods are erect or stiffly ascending, cylindric or linear-ellipsoid, and usually 6–9.5 × 0.7–1 cm.

TYPEFICTION: One of the three original references, that to L. Fl. Zeyl. 64. 1747, is taken to typify the species: Herb. Hermann (BM LECTOTYPE) (Trimen in J. Linn. Soc. Bot. 24: 141. 1887).

DISTRIBUTION: Pantropical, but perhaps originally paleotropical, according to Irwin and Barneby's discussion (1982, pp. 439–443). However, those authors are not entirely satisfied that all the American populations of *Senna sophera* are identical with the nomenclaturally typical paleotropical taxon. It may be suspected that *S. sophera*, in this broad sense, is indigenous in the Pacific as far eastward as Tonga and Samoa. This was the opinion of Seemann (1865); the species was first collected in Fiji and Samoa by the U. S. Exploring Expedition. No recent collections from Fiji have been seen, but a few are available from Tonga and Samoa, at least some of which appear indigenous. It is also questioned by Irwin and Barneby whether the taxon of this immediate relationship in Australasia (including New Caledonia and Fiji) should remain in *S. sophera* or (following Symon in Trans. & Proc. Roy. Soc. South Australia 90: 89–92. 1966) be placed in "*Cassia*" *barclayana* Sweet or "*C.*" *planitiicola* Domin. This question cannot be pursued in the present work.

AVAILABLE COLLECTIONS: FIJI without further locality, *U. S. Expl. Exped.*, *Horne* 1029; *Williams* was cited by Seemann (1865) but the specimen has not been located.

10. *Senna alata* (L.) Roxb. Fl. Ind. ed. 2. 2: 349. 1832; Irwin & Barneby in Mem. New York Bot. Gard. 35: 460. 1982.

Cassia alata L. Sp. Pl. 378. 1753; Christophersen in Bishop Mus. Bull. 128: 99. 1935; Yuncker in op. cit. 178: 60. 1943; de Wit in Webbia 11: 231. 1955; J. W. Parham, Pl. Fiji Isl. 63. 1964, ed. 2. 97. 1972; Symon in Trans. & Proc. Roy. Soc. South Australia 90: 94. 1966; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 64. 1967; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 55. 1970; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 28, 47. 1972; Verdcourt, Man. New Guinea Leg. 38. fig. 7. 1979.

Shrub or tree 2–5 m. high, cultivated in gardens and villages and becoming sparingly naturalized in swampy places at elevations from near sea level to about 250 m. The large, coarse leaves are as long as 75 cm. and have 5–13 pairs of distally accrescent leaflets with blades up to 19×10 cm. The conspicuous inflorescences are composed of many-flowered racemes 15–60 cm. long, with large, yellow or orange bracts subtending flowers and also aggregated into a terminal cone; the orange-yellow sepals are as long as 16 mm.; and the bright yellow petals may be up to 16–23 mm. long. The pods are widely ascending and sharply tetragonal, with lengthwise wings down the middle of each valve, usually 12–19 cm. long and 2–3 cm. broad including wings. Flowers seem to occur mostly between May and August.

TYPIFICATION: Of the five references given by Linnaeus, the lectotype may be taken from that to *Hortus Cliffortianus*: a cultivated plant represented in Herb. Cliffort. (BM LECTOTYPE) (cf. Brenan, 1967), consisting of a single leaf. The indication of LINN 528.26 as lectotype, proposed by de Wit (1955), is not sustainable because that specimen became available to Linnaeus only in 1758 (Irwin & Barneby, 1982).

DISTRIBUTION: Tropical America, now extending into subtropical and warm temperate regions in America, but long established in paleotropical areas as a medicinal or ornamental plant or as a naturalized weed. In Fiji it is more common in village cultivation than suggested by the available specimens and is occasionally naturalized near villages.

LOCAL NAMES AND USES: *Golden candelabra tree*; *Roman candle tree*; *mbai ni thangi*. In addition to being a striking ornamental, the species is used medicinally, the leaves and seeds being rubbed on the skin to cure infections.

AVAILABLE COLLECTIONS: VITI LEVU: NAMOSE: Nambukavesi Creek, *DF 409*, *Damanu 81*. NAITASIRE: Savura Creek, *Weiner 140*. REWA: Suva Botanical Gardens, *DA 12107*; Suva Point, *Weiner 105*. OVALAU: Lovoni Village, *Smith 7464*.

11. *Senna didymobotrya* (Fresen.) Irwin & Barneby in Mem. New York Bot. Gard. 35: 467. 1982.

Cassia didymobotrya Fresen. in Flora 22: 53. 1839; de Wit in Webbia 11: 241. 1955; Symon in Trans. & Proc. Roy. Soc. South Australia 90: 95. 1966; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 66. fig. 12. 1967; Verdcourt, Man. New Guinea Leg. 41. fig. 8. 1979.

Cassia bakeriana sensu J. W. Parham, Pl. Fiji Isl. 63. 1964, ed. 2. 97. 1972; non Craib.

A shrub 1–5 m. high with dense, foetid foliage, sparingly cultivated near sea level. From the related and (in Fiji) more frequent *Senna alata*, the present species differs in stipules, apex of leaf blade, the often subsistent, pale indument of its foliage and inflorescences, and its dull floral bracts. The leaves, 10–40 cm. long, have 8–18 pairs of comparatively congested leaflets with smaller, elliptic-oblong blades, each with an aristate mucro 1–3 mm. long. The racemes are 10–40 cm. long, the longest sepals 10–14 mm. long, and the longest petals 17–27 mm. long. The spreading or ascending pods are strongly compressed, 7–12 \times 1.5–2.5 cm., and bicarinate by the sutures. The only available collection was flowering in November.

TYPIFICATION: The type was collected in Abyssinia by Ruppell, but no holotype is found at FR, where Ruppell's specimens in the Fresenius herbarium should be located. The present interpretation of this unmistakable species follows that of the authors cited above.

DISTRIBUTION: Tropical Africa, now widely cultivated and often becoming naturalized in tropical areas and sometimes extending to warm temperate regions. Only one Fijian collection has been noted; this was listed by Parham (1964, 1972) as *Cassia bakeriana*, an entirely unrelated species, but perhaps the original introduction in 1952 was made under that name.

USE: Ornamental.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRE: Plant Introduction and Quarantine Station, Nanduruloulou, DA 12254.

12. *Senna multijuga* (L. C. Rich.) Irwin & Barneby in Mem. New York Bot. Gard. 35: 492. 1982.

Cassia multijuga L. C. Rich. in Actes Soc. Hist. Nat. Paris 1: 108. 1792; de Wit in Webbia 11: 253. 1955; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 50. 1967; Verdcourt, Man. New Guinea Leg. 50. 1979.

TYPIFICATION: The type, from Cayenne, is *Leblond* (HOLOTYPE at P in Herb. Richard; ISOTYPE at P-LA) (cf. Irwin and Barneby, 1982).

DISTRIBUTION: Tropical America, now widely cultivated in tropical and subtropical areas. Irwin and Barneby (1982) recognize three subspecies, two of them further divided into varieties. The commonly cultivated variety is *Senna multijuga* subsp. *multijuga* var. *multijuga*, but Irwin and Barneby (1982, pp. 494, 498) indicate it to be a matter of record that the variety cultivated in Fiji is subsp. *lindleyana* var. *lindleyana*, probably introduced from Rio de Janeiro.

12a. *Senna multijuga* subsp. *lindleyana* (Gardner) Irwin & Barneby in Mem. New York Bot. Gard. 35: 497. 1982, var. *lindleyana*; Irwin & Barneby in op. cit. 35: 498. 1982.

Cassia lindleyana Gardner in London J. Bot. 2: 341. 1843.

Cassia multijuga sensu J. W. Parham, Pl. Fiji Isl. 63. 1964, ed. 2. 98. 1972; non sensu str.

Tree 9–11 m. high (up to 25 m. where indigenous), found in cultivation from near sea level to 250 m., or perhaps sparingly and locally naturalized on edges of forest. The larger leaves are up to 30 cm. long, with 16–36 (–46) pairs of leaflets gradually decrescent toward base and apex of leaf, and the largest leaflets are up to 46 × 13 mm. The flowers have greenish to yellow sepals, the largest (inner) one up to 7.5 mm. long, and the yellow petals are as long as 16–26 mm. Flowers have been noted in March and April.

TYPIFICATION: The type is *Gardner 367* (K HOLOTYPE; ISOTYPES at FI, K, NY), collected in April, 1837, in the Organ Mountains, Rio de Janeiro, Brazil (data from Irwin and Barneby).

DISTRIBUTION: Brazil, from Bahia and Minas Gerais to Santa Catarina, known to be cultivated at least in southern Brazilian cities, in southern California, and in Fiji. The specimens known from Fiji are all from an introduction made in 1947 (Parham, 1964, 1972, cited above).

USE: A very attractive ornamental.

AVAILABLE COLLECTIONS: VITI LEVU: NAMOSI: Nambukavesi Creek, DA 13856 (DF 298), *Damanu 26*. NAITASIRE: Forest Park, Tholo-i-suva, DF 308, 344, *Damanu 31*.

Subspecies *lindleyana* differs from subsp. *multijuga* in having its stipules setiform, not more than 0.6 mm. broad at base, and with plane margins (rather than, as in subsp. *multijuga*, asymmetrically dilated and 0.8–2.5 mm. broad at base and undulately crimped or folded). A second variety of subsp. *lindleyana*, not known to occur outside of South America, has substantially smaller leaflet blades than var. *lindleyana*.

13. *Senna pallida* (Vahl) Irwin & Barneby in Mem. New York Bot. Gard. 35: 531. 1982.

(?) *Cassia biflora* L. Sp. Pl. 378, nom. ambig. 1753.

Cassia pallida Vahl, Eclog. Amer. 3: 12. 1807.

TYPIFICATION AND NOMENCLATURE: Irwin and Barneby (1982, pp. 531, 535) consider *Cassia biflora* L. to be a nomen ambiguum; it was described from a plant grown in Clifford's garden at Hartekamp, of which no type is extant. (These authors apparently

disagree with de Wit's (1955, p. 238) designation of LINN 528.21 as the holotype.) The protologue could be interpreted to refer to more than one species, hence Irwin and Barneby suggest that it not be used; ICBN (Art. 69) provides for placing such names on a list of nomina rejicienda, thus far not established. The type of *C. pallida* is *von Rohr* (C HOLOTYPE in Herb. Vahl), from Santa Marta, Colombia. Irwin and Barneby (1982) recognize 19 varieties in *Senna pallida*. Of these, var. *bahamensis* is presumably the one cultivated outside the native area of the species.

DISTRIBUTION: Tropical and subtropical America, with a substantial range of habitat and elevation.

13a. *Senna pallida* var. *bahamensis* Irwin & Barneby in Mem. New York Bot. Gard. 35: 548. 1982.

Cassia biflora sensu de Wit in Webbia 11: 238. 1955; J. W. Parham, Pl. Fiji Isl. 63. 1964, ed. 2. 97. 1972.

Slender shrub to 4 m. high, infrequently cultivated near sea level. The leaves are about 5–9 cm. long, usually with 4–7 pairs of distally accrescent leaflets, these with blades prevailing obovate, up to 35 × 15 mm., and pale beneath. The largest sepals are 5–8 mm. long, and the golden-yellow petals are up to 14–19 mm. long.

TYPIFICATION: The type of the variety is *A. H. Curtiss 50* (NY HOLOTYPE; ISOTYPE at US), collected Jan. 26, 1903, near Nassau, New Providence, Bahama Islands.

DISTRIBUTION: Low elevations in the Bahamas and eastern Cuba; cultivated in the continental United States, Hawaii, and presumably elsewhere. The only available Fijian collection is from a coastal resort area.

AVAILABLE COLLECTION: VITI LEVU: NANDRONGA & NAVOSA: Korolevu, Sovi Bay, DA 12062.

10. *CHAMAECRISTA* Moench, Meth. Pl. 272. 1794; Irwin & Barneby in Mem. New York Bot. Gard. 35: 636. 1982.

Cassia subgen. *Lasiorhagma* Vogel ex Benth. in Mart. Fl. Bras. 15(2): 129. 1870; de Wit in Webbia 11: 278. 1955.

Cassia subgen. *Absus* Symon in Trans. & Proc. Roy. Soc. South Australia 90: 77. 1966.

Trees, shrubs, or herbs, often with extrafloral nectaries on leaf petioles and/or raceme axes; leaves spirally arranged or distichous, paripinnate, the leaflets opposite (numerous and small in our taxa); inflorescences 1–many-flowered, racemose, the axis sometimes adnate to stem, the pedicels 2-bracteolate near or above middle; flowers ♂, the sepals 5, imbricate; petals 5, nearly always highly heteromorphic, yellow (sometimes red-marked near claw), the 2 abaxial ones variously oblique, the vexillar one usually interior in bud but sometimes exterior on one or both sides; androecium functionally (2–) 5–10-merous, essentially actinomorphic, the filaments straight, short, the anthers basifixed, equal or unequal (if unequal not accrescent toward abaxial side of flower), puberulent or pilosulous along lateral sutures, dehiscent by pores or short slits apically; fruit plano-compressed, very rarely winged along sutures, elastically dehiscent, the valves coiling, papery, leathery, or subliguous, the seed funicle deltately dilated, the seeds with a smooth or pitted testa, without areoles.

LECTOTYPE SPECIES: *Chamaecrista nictitans* (L.) Moench (*Cassia nictitans* L.); vide Britton and Rose in N. Amer. Fl. 23: 270. 1930; Irwin and Barneby in Mem. New York Bot. Gard. 35: 664. 1982.

DISTRIBUTION: Circumtropical, but mostly American, and also occurring in warm temperate areas, with about 265 species. Two species occur in Fiji, one a widespread weed and the other known only in introduction plots.

USEFUL TREATMENTS OF GENUS: As listed under *Cassia*.

KEY TO SPECIES

Stipules lanceolate, usually 5–15 mm. long and prominently 5–13-nerved; leaves with petioles 3–7 mm. long, the gland variable but usually slightly elevated (depressed in center) and 0.5–1 mm. in diameter, sometimes obovoid-stipitate; leaf rachis sulcate, the margins of furrow not raised between leaflet pairs and appearing only narrowly winged; leaflets 10–26 (–31) pairs, the blades usually 10–23 × 2–3 mm. and with venation evident on both surfaces; seeds nearly as broad as long; an often locally abundant weed. 1. *C. nictitans*

Stipules acicular to lanceolate, usually 3–10 mm. long and with only 1–3 nerves in distal portion; leaves with petioles 1–3 mm. long, the gland flat, discoid, 0.3–1 mm. in diameter; leaf rachis seemingly serrate, the margins of furrow slightly expanded between leaflet pairs into rounded wings; leaflets 15–40 (–80) pairs, the blades usually 2–8 × 0.5–1.5 mm. and with venation often immersed or obscure on upper surface; seeds about half as long as broad; known only in introduction plots. 2. *C. mimosoides*

1. ***Chamaecrista nictitans* (L.) Moench, Meth. Pl. 272. 1794; Irwin & Barneby in Mem. New York Bot. Gard. 35: 811. 1982.**

Cassia nictitans L. Sp. Pl. 380. 1753.

LECTOTYPIFICATION: *Cassia nictitans* is typified by the reference to L. Hort. Clifffort. t. 36. 1738: Herb. Clifffort. *Cassia* No. 1, excl. fl. (BM LECTOTYPE) (cf. Pennell in Bull. Torrey Bot. Club 44: 356. 1917; Irwin and Barneby, 1982, p. 840).

DISTRIBUTION: Widespread in America, highly polymorphic, and with one variety introduced into the Old World. Irwin and Barneby divide the species into four subspecies, the variety occurring in the Old World belonging to subsp. *patellaria*.

Chamaecrista nictitans subsp. *patellaria* (DC. ex Colladon) Irwin & Barneby (in Mem. New York Bot. Gard. 35: 814. 1982) is based on *Cassia patellaria* DC. ex Colladon, Hist. Nat. Méd. Casses, 125. t. 16. 1816. Colladon's name is typified by *Thibaud* (G-DC LECTOTYPE), collected in Cayenne (cf. Irwin and Barneby, 1982, p. 818, where the variety including this name is established as var. *ramosa* (Vogel) Irwin & Barneby, based on the oldest varietal name for the varietal concept, cf. ICBN, Art. 26.2).

The variety found in the Old World is referable to *Chamaecrista nictitans* subsp. *patellaria* var. *glabrata*, which may be used as the following trinomial (ICBN, Art. 24.1).

1a. ***Chamaecrista nictitans* var. *glabrata* (Vogel) Irwin & Barneby in Mem. New York Bot. Gard. 35: 822. 1982.**

Cassia lechenaultiana DC. in Mém. Soc. Phys. Genève 2: 132. 1824; de Wit in Webbia 11: 280. 1955; Symon in Trans. & Proc. Roy. Soc. South Australia 90: 134. 1966; Verdcourt, Man. New Guinea Leg. 48. fig. 11. 1979.

Cassia patellaria var. *glabrata* Vogel, Syn. Gen. Cass. 66. 1837.

Chamaecrista lechenaultiana Degener, Fl. Haw. Fam. 169b. 1934.

Cassia mimosoides sensu Christophersen in Bishop Mus. Bull. 128: 99. 1935; J. W. Parham in Dept. Agr. Fiji Bull. 35: 80. fig. 38. 1959; Pl. Fiji Isl. 63. 1964; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 55. 1970; St. John & A. C. Sm. in Pacific Sci. 25: 327. 1971; non L.

Cassia lechenaultiana DC. ex Greenwood in J. Arnold Arb. 30: 76. 1949, in op. cit. 36: 398. 1955; Yuncker in Bishop Mus Bull. 220: 135. 1959; J. W. Parham, Pl. Fiji Isl. ed. 2. 98. 1972.

Chamaecrista nictitans var. *glabrata*, which has long passed as *Cassia* (or *Chamaecrista*) *lechenaultiana* in Pacific archipelagoes, is seen in Fiji from near sea level to an elevation of about 300 m. It is a subliguous herb or shrub 0.5–2 m. high and has become abundant locally as a weed along roadsides and in cultivated areas, sometimes in coconut plantations. The species is confusingly variable, even in the variety that has become widely dispersed in the Pacific, but it is readily distinguished from *C. mimosoides* by its larger (and fewer) leaflets and more conspicuous stipules.

TYPIIFICATION AND NOMENCLATURE: The oldest varietal name for this concept, *Cassia patellaria* var. *glabrata* Vogel, is based on a collection by Siebert: Herb. Willdenow 8000/1 (B HOLOTYPE). *Cassia lechenaultiana* is typified by *Leschenault* (G-DC HOLOTYPE), from Bengal, dated 1821. *Leschenault* de la Tour sometimes spelled his name without the "s", and de Candolle's spelling is intentional (de Wit, 1955, p. 282). A specimen at K, *Greenwood 183*, bears an unpublished name in *Cassia* as a "sp. nov.", dated 1930, suggesting that this widespread weed has been puzzling to students of local floras; this is further indicated by the many other synonyms listed by Irwin and Barneby (1982).

DISTRIBUTION: Widespread in tropical America from the West Indies and southern Mexico to Peru and Brazil (probably adventive in southern part of range); it has long been naturalized in parts of the Old World from India and Ceylon eastward into the Pacific including Hawaii. The first published record of this weed in Fiji was *Greenwood's* in 1949, but it was first collected by him many years earlier, and it was present in Samoa in 1921 or earlier. It was probably an accidental introduction, being unpalatable to stock and without any apparent useful attributes. Eighteen Fijian collections are at hand, but they give an inaccurate picture of the abundance of the taxon on the drier coasts of Viti Levu. Flowers and fruits occur throughout the year.

REPRESENTATIVE COLLECTIONS: VITI LEVU: Mba: Near Ndrasa, vicinity of Lautoka, *Greenwood 1183A*; near Tawarau, between Lautoka and Rarawai, *Greenwood 1183*; Rarawai, *Greenwood 183*; Sambeto River Valley, *DA 10297*; vicinity of Nandi, *DA 8986*; Mba township, *DA 8191*. NADRONGA & NAVOSA: Volivoli, near Singatoka, *DA 10661*. RA: Yanggara, *DA 10734*. NAITASIRE: Koronivia, *DA 7544*. VANUA LEVU: THAKAUNDOVE: Nasekawa East, Wailevu, Savusavu Bay, *DA 9633*.

2. *Chamaecrista mimosoides* (L.) Greene in Pittonia 4: 27. 1899.

Cassia mimosoides L. Sp. Pl. 379. 1753; de Wit in Webbia 11: 283. 1955; Symon in Trans. & Proc. Roy. Soc. South Australia 90: 133. 1966; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 100. fig. 10 (48). 1967; J. W. Parham, Pl. Fiji Isl. ed. 2. 98. 1972; Verdcourt, Man. New Guinea Leg. 50. 1979.

In Fiji *Chamaecrista mimosoides* is known only from introduction plots and apparently has not become naturalized. It is an erect herb to 1.5 m. high, with woody stems, readily distinguished from the naturalized *C. nictitans* var. *glabrata* by its leaves with more numerous and smaller leaflets, with shorter petioles and less obvious glands, and with the rachis expanded and winglike between the leaflet pairs.

TYPIIFICATION: *Cassia mimosoides* is based entirely on Fl. Zeyl. 154. 1747: Herb. Hermann, vol. 2, pp. 13, 78 (BM SYNTYPES).

DISTRIBUTION: Widespread in the paleotropics; apparently a comparatively recent introduction into Fiji and not established. In New Guinea and the Caroline Islands it seems to occur as a weed, but probably reports of its naturalization in the Fijian Region are due to confusion with *Chamaecrista nictitans* var. *glabrata*.

LOCAL NAME AND USES: *Japanese tea*; sometimes used as a green manure and perhaps introduced into Fiji with that purpose in view; a tea can be made from the leaves.

AVAILABLE COLLECTIONS: VITI LEVU: NADRONGA & NAVOSA: Agricultural Station, Nathotholevu, near Singatoka, *DA 12578*. NAITASIRE: Plant Introduction and Quarantine Station (Cocoa Station), Nanduruloulou, *DA 9560, 12147*.

11. BAUHINIA L. Sp. Pl. 374. 1753; Seem. Fl. Vit. 69. 1865; de Wit in Reinwardtia 3: 390, sensu str. 1956; Hutchinson, Gen. Fl. Pl. 1: 242. 1964; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 207, sensu str. 1967; Verdcourt, Man. New Guinea Leg. 112, sensu str. 1979.

Shrubs and small trees (rarely semiscandent), sometimes with intrastipular spines, or lianas (none of our species) with tendrils and without spines, the stipules linear to deltoid, caducous; leaves simple, the blades 3-many-nerved, entire or bilobed, rarely divided as far as base; inflorescences terminal, axillary, or leaf-opposed, racemose (as in our species) or paniculate or 1-flowered; flowers often large and showy, ♂ or unisexual; calyx tube (hypanthium) cupuliform or cyathiform to long-tubular, the limb spathaceous or split to hypanthium into 2-5 lobes (as in our species) or with the lobes or teeth free or variously connate; petals (2-) 5 (-6), subequal, erect or spreading, imbricate, the uppermost within in bud; stamens 10 or fewer, sometimes all perfect, sometimes in part reduced to staminodes or deficient, the filaments free to short-connate, the anthers ellipsoid to linear, versatile, dehiscent lengthwise; ovary usually stipitate, the gynophore free or (as in our species) abaxially adnate to hypanthium, the ovules 2-many, the style short to elongate (as in our species), the stigma terminal or oblique, often peltate; fruit oblong to linear, somewhat woody to thin-walled, dehiscent (often explosively so) and 2-valved or infrequently indehiscent, septate or not, the seeds few to many, orbicular to ellipsoid, compressed.

LECTOTYPE SPECIES: *Bauhinia divaricata* L. (vide L. Gen. Pl. ed. 5. 177. 1754; etiam de Wit in Reinwardtia 3: 390. 1956), one of Linnaeus's eight original species.

DISTRIBUTION: Pantropical, subtropical, and warm temperate (but apparently not indigenous in the Pacific east of Malesia), with about 250 species. Several species are cultivated and sometimes naturalized in Pacific archipelagoes, five being recorded in Fiji.

USEFUL TREATMENT OF GENUS: WIT, H. C. D. DE. A revision of Malaysian Bauhiniae. Reinwardtia 3: 381-539. 1956.

Attempts have been made to divide *Bauhinia* into several genera, and the classification proposed by de Wit (1956) has been followed by Brenan (1967) and Verdcourt (1979). Wunderlin, K. Larsen, and S. Larsen (in Adv. Leg. Syst. 114-116. 1981) consider generic segregates inadvisable but recognize four "groups," pending a redefinition of infrageneric categories. All the species cultivated in Fiji belong in *Bauhinia* sensu str. (with about 90 species).

KEY TO SPECIES

Fertile stamen 1; staminodes 5, small; petals long-clawed, 4-5.5 × 2-3 cm., white to pink, with red blotches or dots, the uppermost one spotted with deeper red, yellow or yellow-margined; leaf blades ovate-oblong, 7-20 cm. long and broad, cordate to rounded at base, pubescent beneath when young, lobed about 1/5-1/2 their length, the lobes obtuse to subacuminate. 1. *B. monandra*

Fertile stamens 3-10.

Petals crimson to deep red, yellow-dotted without, 2.5-4 cm. long, the claw nearly as long as the lamina; fertile stamens 3; leaf blades crescent-shaped, 2-5 cm. long and broad, cordate to rounded at base, shallowly lobed to about 1/3 their length, the lobes rounded. 2. *B. galpinii*

Petals white or yellow to purple, not clawed or with a claw much shorter than the lamina.

Fertile stamens 10; corolla campanulate, the petals yellow, 1-3 of them sometimes purple-blotched within, 2.5-5.5 cm. long, overlapping at margins; leaf blades variable but subcircular, up to 10 × 11 cm. long and broad, sometimes pilose beneath, truncate to subcordate at base, usually lobed to about 1/3 their length, the lobes rounded. 3. *B. tomentosa*

Fertile stamens 3 or 5.

Flower buds 4- or 5-angled or -winged; petals pale purple, shading to pinkish proximally, oblanceolate, 3-6 cm. long, not more than 2 cm. broad; fertile stamens 3; staminodes 7; leaf blades elliptic to suborbicular, 6-19 cm. long and broad, rounded to cordate at base, lobed 1/2-1/4 their length, the lobes rounded to acute. 4. *B. purpurea*

Flower buds not angled or winged; petals pale purple or rose or white or yellow, obovate, 4-6 cm. long, 2-3 cm. broad, the uppermost one broader; fertile stamens 5; staminodes 5, about half as long as stamens; leaf blades broadly ovate to suborbicular, 5-14 cm. long and broad, cordate to truncate at base, lobed about 1/3 their length or less, the lobes rounded. 5. *B. variegata*

1. *Bauhinia monandra* Kurz in J. Asiat. Soc. Bengal **42** (2): 73. 1873; Greenwood in Proc. Linn. Soc. **154**: 97. 1943; Yuncker in Bishop Mus. Bull. **178**: 60. 1943; A. C. Sm. in Bull. Torrey Bot. Club **70**: 541. 1943; de Wit in Reinwardtia **3**: 401. 1956; Yuncker in Bishop Mus. Bull. **220**: 135. 1959; J. W. Parham, Pl. Fiji Isl. **62**. 1964, ed. 2. 95. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 54. 1970; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 141. 1972; Verdcourt, Man. New Guinea Leg. **115**. 1979.

A tree 3–4 m. high as cultivated in Fiji near sea level. The single fertile stamen readily characterizes this species, together with its white or pink, red-spotted petals, one of which is at least partially yellow. Its fruits are narrowly oblong and up to 22 × 3 cm. As far as dated, our material bore flowers and fruits in November and February.

TIPIFICATION: The type is a specimen collected by Brandis at Martaban, Burma.

DISTRIBUTION: The species is probably indigenous in tropical America, but it is now in widespread cultivation.

LOCAL NAME AND USE: Called *pink butterfly tree* in Fiji, this ornamental is said to have been established for many years, but from available material its introduction was probably not much earlier than 1920.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Tonuve, Ruwailevu Tikina, *H. B. R. Parham 144, 158*; Singatoka, *Greenwood 773*. REWA: Suva Botanical Gardens, *DA 12298*. VANUA LEVU: THAKAUNDOVE: Along Hibiscus Highway east of Savusavu, *Bierhorst F165*. FIJI without further locality, *Gillespie 4399*.

2. *Bauhinia galpinii* N. E. Br. in Gard. Chron. III. **9** (1): 728, as *B. galpini*. (June) 1891; de Wit in Reinwardtia **3**: 398. *fig. 2*. 1956; Verdcourt, Man. New Guinea Leg. **115**. *fig. 29*. 1979.

Bauhinia galpini N. E. Br. in Hook. Icon. Pl. **20**: *t. 1994*. (August) 1891; J. W. Parham, Pl. Fiji Isl. **62**. 1964, ed. 2. 95. 1972.

A shrub clambering to 9 m. high, but usually maintained in cultivation as a smaller plant, characterized by its three fertile stamens and its deep red petals; the fruit is comparatively small, up to 7 × 1.5 cm.

TIPIFICATION: In both of his descriptions of 1891 Brown cited three collections from South Africa; probably an appropriate LECTOTYPE would be *Nelson 409*, from "Dorn Spruit Spelunken," Transvaal.

DISTRIBUTION: Southern Africa, now widely cultivated in tropical areas.

LOCAL NAME AND USE: This attractive ornamental is known as *red butterfly tree*.

No vouchers seem to support the record of *Bauhinia galpinii* in Fiji, but it is an unmistakable species, said by Parham to be uncommon, introduced prior to 1940 by W. L. Wallace.

3. *Bauhinia tomentosa* L. Sp. Pl. **375**. 1753; Seem. Fl. Vit. **69**. 1865; de Wit in Reinwardtia **3**: 409. 1956; J. W. Parham, Pl. Fiji Isl. **62**. 1964, ed. 2. 96. 1972; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. **209**. 1967; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 141. 1972; Verdcourt, Man. New Guinea Leg. **118**. *fig. 30*. 1979.

A shrub or small tree 3–4 m. high as cultivated in Fiji near sea level, *Bauhinia tomentosa* is readily recognized by its flowers with ten fertile stamens, a pubescent calyx, and yellow petals overlapping to form a campanulate corolla. Its fruits attain a size of about 15 × 2 cm. Our specimens bore flowers and fruits in January and March.

LECTOTYPIFICATION: Brenan (1967) states that, in the absence of authentic specimens at LINN, Roti-Michelozzi (in Webbia **13**: 153. 1957) indicated the LECTOTYPE as Burm. Thes. Zeyl. *pl. 18*. 1736, one of Linnaeus's several references. The neotype

suggested by de Wit (1956) is unnecessary.

DISTRIBUTION: Tropical Africa to southeastern Asia, now widely cultivated elsewhere. Of the two forms recognized by de Wit, our material falls into f. *tomentosa*.

LOCAL NAME AND USE: *Yellow butterfly tree* is the name applied to this ornamental, at least locally.

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Lami, in private garden, DA 16463; Suva Botanical Gardens, DA 12292; Albert Park, Suva, DA 11835.

Seemann in 1865 cited a sterile Williams specimen, which I was unable to locate at K, as representing *Bauhinia tomentosa*. If that early introduction date is not correct, the species was in Fiji at least before 1886, when it was listed in J. B. Thurston's *Catalogue*.

4. *Bauhinia purpurea* L. Sp. Pl. 375. 1753; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 90. 1948; de Wit in Reinwardtia 3: 406. 1956; J. W. Parham in Agr. J. Dept. Agr. Fiji 29: 31. 1959, Pl. Fiji Isl. 62. 1964, ed. 2. 95. 1972; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 141. 1972; Verdcourt, Man. New Guinea Leg. 118. 1979.

A shrub or small tree 5-7 m. high, commonly cultivated near sea level, or possibly sparingly naturalized along roadsides. Its fragrant flowers, with three fertile stamens, have pale purple petals paler at base; its fruits may be as large as 30 × 2.5 cm. It flowers in July and continues flowering over a long period of time.

TYPIFICATION: The only Linnaean reference is to Rheede, Hort. Ind. Malabar 1: 59. t. 33. 1678. Nevertheless, de Wit has preferred to indicate a neotype: Merrill, Sp. Blancoanae no. 1050 (L no. 920.278-111).

DISTRIBUTION: Southeastern Asia, now widely cultivated throughout the tropics. Among the three varieties recognized by de Wit (1956), our material represents var. *purpurea*.

LOCAL NAMES AND USE: Locally known as *purple butterfly tree* or *pink butterfly tree*, this *Bauhinia* is another desirable ornamental. It may have been first introduced by J. B. Thurston, being listed in his 1886 *Catalogue*.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Principal Agricultural Station, Koronivia, DA 11917. REWA: Suva Botanical Gardens, DA 12095.

5. *Bauhinia variegata* L. Sp. Pl. 375. 1753; de Wit in Reinwardtia 3: 411. 1956.

DISTRIBUTION: Eastern Asia, now widely cultivated. The two commonly cultivated varieties of *Bauhinia variegata* have been recorded in Fiji, but a date of introduction cannot accurately be suggested; they were established at least by the 1940's.

The species is characterized by having five fertile stamens; its petals are variable in color.

KEY TO VARIETIES

Petals pale purple to rose, the uppermost one darker, with purple or crimson veins or blotches.

5a. var. *variegata*

Petals white to yellowish, with green veins, purplish without. 5b. var. *candida*

- 5a. *Bauhinia variegata* var. *variegata*; de Wit in Reinwardtia 3: 411. 1956; J. W. Parham, Pl. Fiji Isl. 62. 1964; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 141, as *B. variegata*. 1972; Verdcourt, Man. New Guinea Leg. 119. 1979.

A shrub or small tree to 8 m. high, the typical variety has darker petals than var. *candida*; both varieties have large fruits, up to 30 × 2.5 cm.

TYPIFICATION: Linnaeus gave three prior references for his species, including one to Rheede, Hort. Ind. Malabar 1: 57. t. 32. 1678. De Wit (1956) preferred to indicate a neotype: Reporter on Economic Products to the Government of India, no. 12187 (L 908.112-142), collected at Bodhupore, Bogra, India, on Feb. 16, 1897.

LOCAL NAME AND USE: *Butterfly tree*; ornamental.

No vouchers of this variety have been seen, but Parham (1964) indicates it as moderately common.

- 5b. *Bauhinia variegata* var. *candida* Voigt, Hort. Suburb. Calcut. 253. 1845; J. W. Parham in Agr. J. Dept. Agr. Fiji 29: 31. 1959, Pl. Fiji Isl. 62. 1964, ed. 2. 96. 1972; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 141. 1972; Verdcourt, Man. New Guinea Leg. 119. 1979.

Bauhinia variegata var. β Buch.-Ham. in Trans. Linn. Soc. 13: 496. 1822.

Bauhinia candida Roxb. Fl. Ind. ed. 2. 2: 318, nom. illeg. 1832; non Ait. (1789) nec Willd. (1799).

Bauhinia variegata var. *alboflava* de Wit in Reinwardtia 3: 412. 1956.

A cultivated tree, similar to var. *variegata* except in the color of its petals, and perhaps sparingly naturalized in forest at higher elevations (*DA 14759*) as well as cultivated near sea level.

TYPIFICATION: Although Voigt's variety was based on *Bauhinia candida* Roxb., illegitimate as a later homonym, his trinomial may be considered as new, without a parenthetical author, dating from 1845 (ICBN, Art. 72). Several localities were cited by Voigt; Roxburgh's concept may be based on a specimen now at K as "N.403." De Wit did not account for Voigt's trinomial and proposed a new var. *alboflava*, the type of which is *Kiah s. n.*, Singapore Bot. Gard., Lawn Z (SING HOLOTYPE), Jan. 25, 1928.

LOCAL NAMES AND USE: This attractive ornamental is locally known as *white bauhinia* or *white butterfly tree*.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: "Naloto Range," *DA 14759*. RA: Between Penang and Ellington, *Greenwood 790*. The variety was growing in the Suva Botanical Gardens in 1959 (J. W. Parham).

12. **CYNOMETRA** L. Sp. Pl. 382. 1753; A. C. Sm. in J. Arnold Arb. 36: 279. 1955; Hutchinson, Gen. Fl. Pl. 1: 235. 1964; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 111. 1967; van Meeuwen in Blumea 18: 12. 1970; Verdcourt, Man. New Guinea Leg. 77. 1979.

Trees (rarely shrubs), the stipules filiform, fugacious, the leaf buds with congested, comparatively small scales (perules), the leaf flushes flaccid, usually pink; leaves paripinnate (unijugate in our species) (very rarely unifoliolate), the leaflets 1-few pairs, the blades coriaceous, not gland-dotted, asymmetrical, the midrib acroscopic; inflorescences congested-racemose (as in our species) or pyramidally paniculate, short, axillary or borne on older wood, the bracts scarious, subsistent, the bracteoles small, fugacious; calyx tube (hypanthium) short, the sepals 4 (or 5), imbricate, reflexed at anthesis; petals (4 or 5), subequal, imbricate; stamens 10 (8-12), the filaments free or essentially so, filiform, the anthers small, dorsifixed, introrse, dehiscent by longitudinal slits; ovary short-stipitate, free from hypanthium or nearly so, the ovules 1 or 2 (-4), the style filiform, the stigma terminal; fruit woody, rugose to verrucose or smooth, flattened and elastically dehiscent into 2 valves or (as in our species) indehiscent, thickened, ellipsoid to suborbicular, the seed usually 1 (infrequently 2), thick, compressed.

LECTOTYPE SPECIES: *Cynometra cauliflora* L. (vide Britton & Wilson, Sci. Surv. Porto Rico, 363. 1926), one of Linnaeus's two original species.

DISTRIBUTION: Pantropical, with about 70 species. The Asian-Malesian portion of the genus terminates its range in Fiji with two endemic species; a third species is infrequently cultivated in Fiji.

USEFUL TREATMENT OF GENUS: KNAAP-VAN MEEUWEN, M. S. A revision of four genera of the tribe Leguminosae-Caesalpinioideae-Cynometreae in Indomalaysia and the Pacific. *Blumea* 18: 1-52. 1970. (*Cynometra*, pp. 12-31.)

KEY TO SPECIES

Inflorescences composed of 4 or 5 racemes crowded together on hard knots on tree trunk; leaves unijugate, the petiole 2-8 mm. long, the leaflet blades ovate- or obovate-oblong to -lanceolate, 5.5-16.5 × 1.6-5.6 cm.; sepals and petals not more than 4 mm. long; fruits up to 3 × 2 × 1 cm.; cultivated only.

1. *C. cauliflora*

Inflorescences solitary, axillary or borne on slender branchlets immediately below leaves; leaves unijugate; indigenous species.

Leaves subsessile, the petiole 1-3 mm. long, the leaflet blades subfalcate-ovate-lanceolate, 5-10.5 cm. long, 1.3-3.5 cm. broad; inflorescences small, the rachis 3-5 mm. long, the bracts probably not much longer than 3 mm., the pedicels 3-5 mm. long; style after anthesis 2-3 mm. long; sepals and petals not known. 2. *C. falcata*

Leaves obviously petiolate, the petiole 10-25 mm. long (of juvenile leaves 6-20 mm. long), the leaflet blades asymmetrically elliptic to oblong, 5-11 cm. long and 2-5 cm. broad (of juvenile blades up to 18 × 7 cm.); inflorescences larger, the rachis 10-25 mm. long, the bracts up to 10 × 7 mm., the pedicels at anthesis 7-14 mm. long; sepals up to 6 mm. long; petals up to 6 mm. long; style at anthesis 4-7 mm. long; fruits oblong-ellipsoid, up to 6 × 4.5 × 3.5 cm., the pericarp rugose, the seed usually 1, up to 4 × 3 × 1.5 cm. 3. *C. insularis*

1. *Cynometra cauliflora* L. Sp. Pl. 382. 1753; van Meeuwen in *Blumea* 18: 21. 1970; J. W. Parham, Pl. Fiji Isl. ed. 2. 99. 1972; A. C. Sm. in *Allertonia* 1: 398. 1978.

A tree up to 15 m. high in Malesia, with flowers and fruits borne on its trunk, infrequently cultivated in Fiji near sea level.

TYPIFICATION: Three references were given by Linnaeus; Knaap-van Meeuwen (1970) indicates the type (i. e. LECTOTYPE) as *Cynomorium* Rumph. Herb. Amb. 1: 163. t. 62. 1741.

DISTRIBUTION: Known only in cultivation and probably a cultigen derived from eastern Malesia, but now found from India to Malesia and occasionally elsewhere, as in Fiji.

USE: The fruits are kidney-shaped and brownish green and are edible either raw or cooked and used as a compote or a flavoring for curry.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Wainivoto, near Korovou, east of Tavua, DA 7065. NAITASIRI: Experiment Station, Nasinu, DA 1539.

2. *Cynometra falcata* A. Gray, Bot. U. S. Expl. Exped. 1: 472. 1854; Seem. Viti, 435. 1862, Fl. Vit. 71. 1865; Horne, A Year in Fiji, 260. 1881; Drake, Ill. Fl. Ins. Mar. Pac. 159. 1890; A. C. Sm. in *Sargentia* 1: 38. 1942, in *J. Arnold Arb.* 31: 165. 1950, in op. cit. 36: 279. 1955; J. W. Parham, Pl. Fiji Isl. 64. 1964, ed. 2. 99. 1972; van Meeuwen in *Blumea* 18: 27. 1970; A. C. Sm. in *Allertonia* 1: 398. 1978.

FIGURE 23A.

A slender tree to 4 m. high, with the upper branches subsucculent, apparently very rare in open forest between sea level and an elevation of about 500 m.

TYPIFICATION: The type is *U. S. Expl. Exped.* (US 62096 HOLOTYPE), collected in 1840 at or near Mba, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from the type from Viti Levu and a single collection from Vanua Levu. The Horne collection that I cited in 1950 is now believed referable to the following species.

LOCAL NAME: *Thimbithimbi*.

AVAILABLE COLLECTION: VANUA LEVU: MATHUATA: Southern slopes of Mt. Numbuiloa, east of Lambasa, Smith 6574 (sterile).

When mature, *Cynometra falcata* and *C. insularis* are readily separable by inflorescence characters, but the leaves of sterile, juvenile specimens are confusingly similar.

and in this condition perhaps the petiole length provides the only reliable character for their recognition.

3. *Cynometra insularis* A. C. Sm. in *Sargentia* 1: 38. 1942, in *J. Arnold Arb.* 31: 166. 1950, in op. cit. 36: 279. 1955; J. W. Parham, *Pl. Fiji Isl.* 64. 1964, ed. 2. 99. 1972; van Meeuwen in *Blumea* 18: 26. 1970; A. C. Sm. in *Allertonia* 1: 398. 1978.

FIGURES 23B-D, 24A & B.

A tree 6-25 m. high, occurring at elevations from near sea level to about 600 m. in dense or open forest or on its edges, in riverside forest, in dry gullies, and on hillsides. The flowers, fragrant and attractive to bees, have the petals pure white to cream-colored, the filaments and style pure white, and the anthers yellow. Flowers have been obtained between April and July, fruits between October and January.

TYPIFICATION: The type is *Degener 15491* (A HOLOTYPE; many ISOTYPES), collected June 6, 1941, at Vatundamusewa, vicinity of Rewasa, near Vaileka, Ra Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and now known from six of the high islands. As prior discussions have mentioned few collections, all those known to me are now listed below.

LOCAL NAMES AND USES: Recorded names are *thimbithimbi*, *movi*, *movivula*, *moivi*, and *namo*. The species produces a useful timber for houseposts and other, more commercial purposes. On Waya the species is considered of medicinal use in the treatment of dysentery, the part not being specified.

AVAILABLE COLLECTIONS: YASAWAS: WAYA: West of Mbatinaremba, Naruarua Gulch, *St. John 18055*. VITI LEVU: MBA: Vicinity of Lautoka, *Greenwood 717, 717A, 1202* (juvenile). NANDRONGA & NAVOSA: Nausori Highlands, *DA 13830 (DF 162), DF 1007 (S1553/1), Johns 3*. RA: Mataimeravula, vicinity of Rewasa, near Vaileka, *Degener 15433*; Waingawa, same area, *Degener 15494*. NAITASIRE: Viria, *Meebold 16501* (juvenile); vicinity of Nasinu, *Gillespie 3426, DA L.22232 (DF 73)*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7138, 7207*. KANDAVU: Waikerelo, Naikorokoro, *DF 1018 (S1553/4)*. VANUA LEVU: MATHUATA: Ndreketi River Valley, *DA 325 (Sykes 47)*; Valembasonga, east of Lambasa, *DA 16680*; southern slopes of Mt. Numbuloa, east of Lambasa, *Smith 6382*. RAMBI: *Horne s. n.* (juvenile, GH, K). TAVEUNI: Western slope between Somosomo and Wairiki, *Smith 843*. FIJI without further locality, *Yeoward 34, DA L.13251* (coll. *Berry*), *Howard 15*.

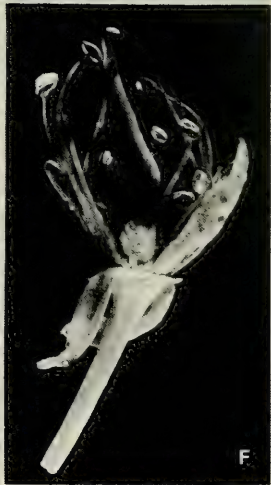
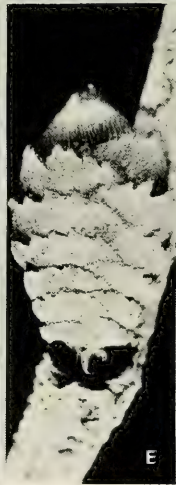
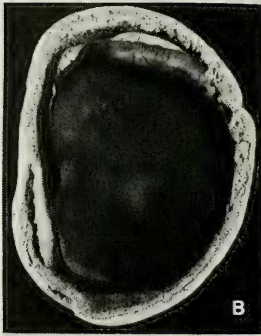
Three sterile collections (*Greenwood 1202, Meebold 16501, Horne s. n.*) cited above, presumably from juvenile plants, have petioles 6-20 mm. long and leaflet blades to 18 × 7 cm., the costa not curved, the secondaries slightly prominulous above. They probably represent *Cynometra insularis* rather than *C. falcata*, juvenile plants of which have the petiole negligible and the leaflet costa distinctly curved.

13. MANILTOA Scheffer in *Ann. Jard. Bot. Buitenzorg* 1: 20. 1876; A. C. Sm. in *Sargentia* 1: 36. 1942, in *J. Arnold Arb.* 31: 166. 1950; Hutchinson, *Gen. Fl. Pl.* 1: 244. 1964; van Meeuwen in *Blumea* 18: 31. 1970; Verdcourt, *Man. New Guinea Leg.* 57. 1979.

Trees, the stipules linear, fugacious, the leaf buds subconical, with conspicuous scales (perules), these imbricate, subrounded, the leaf flushes drooping, usually pink; leaves paripinnate, the leaflets 1-15 pairs (not more than 4 pairs in our species), the blades coriaceous or subcoriaceous, asymmetrical, the midrib acroscopic; inflorescences racemose, contracted, sessile, axillary or borne on defoliate branchlets, with many

FIGURE 23. A, *Cynometra falcata*; distal portion of branchlet of sterile, juvenile plant, with foliage, × 1/3. B-D, *Cynometra insularis*: B, distal portion of branchlet, with foliage and inflorescences, × 1/3; C, flower, with 3 petals removed, several anthers fallen, × 4; D, inflorescence buds, × 1. A from *Smith 6574*, B from *DA 16680*, C from *Smith 7138*, D from *DA 13830*.





imbricate bracts, these reniform (lower ones) to ovate or lanceolate (upper ones), the rachis stout, the bracts and bracteoles deciduous; calyx tube (hypanthium) short, campanulate and circumscissile (as in our species) to tubular and spathaceous, caducous in fruit, the sepals 4 (or 5), subequal, imbricate in bud, reflexed at anthesis; petals 5 (rarely 6), subequal, imbricate; stamens 15-80 (usually 21-40 in our species), the filaments sometimes connate at base, filiform, the anthers dorsifixed, introrse, dehiscent lengthwise; ovary short-stipitate (as in our species) or sessile, free from hypanthium, the ovules (1 or 2), the style elongate, the stigma terminal, usually truncate; fruit woody, smooth, ovoid to globose, indehiscent, the seed usually 1 (sometimes 2), subglobose.

TYPE SPECIES: *Maniltoa grandiflora* (A. Gray) Scheffer (*Cynometra grandiflora* A. Gray). The fact that Scheffer, in proposing the genus, misidentified his New Guinean material (later named as *M. schefferi* K. Schum.) does not affect typification of the genus.

DISTRIBUTION: Southeastern Asia eastward (centering in New Guinea) and extending into the Pacific to Fiji and Tonga, with about 25 species. Four species occur in Fiji, three endemic and one also in Tonga.

USEFUL TREATMENTS OF GENUS: SMITH, A. C. *Maniltoa* Scheff. J. Arnold Arb. 31: 166-171. 1950. KNAAP-VAN MEEUWEN, M. S. A revision of four genera of the tribe Leguminosae-Caesalpinioideae-Cynometreae in Indomalaysia and the Pacific. Blumea 18: 1-52. 1970. (*Maniltoa*, pp. 31-46.)

In the Fijian species the leaves are 1-4-jugate, and the leaflets are asymmetrically elliptic to oblong, subcoriaceous, and with 5-13 subascending principal secondary nerves, the veinlet reticulation being immersed or plane above and somewhat prominulous beneath. The recognized species have many overlapping features but in general are readily distinguished by characters of indument, the predominant number of leaflets, the facies of the vegetative buds, and the trends of dimensional details. Upon reconsideration of a substantial number of available collections I now agree with Knaap-van Meeuwen (1970) that my species *Maniltoa brevipes* and *M. amicorum* are reasonably incorporated into *M. grandiflora*.

KEY TO SPECIES

- Young branchlets and leaves (including rachises) glabrous (even when juvenile in new flushes); inflorescences 13-20-flowered, the rachis and pedicels glabrous (very rarely with a few spreading ferruginous hairs to 0.5 mm. long), the bracteoles 1.5-2 (-6) mm. long, stigose-sericeous only along dorsal median line, the sepals glabrous; stamens 21-40; ovary glabrous or (with base of style) very sparsely pilose distally.
- Mature vegetative buds 2.5-7 cm. long, the largest scales 15-40 mm. long and broad, copiously sericeous-puberulent dorsally (hairs 0.1-0.2 mm. long), sometimes essentially glabrate, scariose and ciliate or eciliate at margin; fully developed leaves 8-23 cm. long, the leaflets 2 or 3 (very rarely 1 or 4) pairs, the petiole 5-22 mm. long, the rachis 2-10 cm. long, the petiolules 1-7 mm. long; leaflet blades (4-) 5-10 × (1.5-) 2-5.5 cm., obtuse to cuspidate at apex (actual apex often slightly emarginate); inflorescence rachis 1-3 cm. long (to 4 cm. in fruit), the pedicels 8-25 mm. long (to 40 mm. in fruit), the flower-subtending bracts 12-35 × 2-10 mm.; sepals 8-15 × 2.5-7 mm.; petals 8-19 × 2-4 mm.; stamens usually 35-40, the filaments 10-25 mm. long; separate to base; style (6-) 10-14 mm. long; mature fruits up to 6 × 3.5 × 1.8 cm. 1. *M. grandiflora*
- Mature vegetative buds not more than 1.5 cm. long, the largest scales 8-12 mm. long and broad, copiously stramineous-strigillose dorsally (hairs 0.1-0.4 mm. long), tardily glabrate, scariose and ciliate and irregularly splitting into short teeth at margin; fully developed leaves 3.5-9 cm. long, the leaflets 1 or 2 pairs, the petioles 4-12 mm. long, the rachis (of 2-jugate leaves) 1.2-3 cm. long, the petiolules 1-2 mm. long; leaflet blades 2.5-6 × 1.7-3.8 cm., rounded to obtuse and emarginate at apex; inflorescence

FIGURE 24. A & B, *Cynometra insularis*; A, fruit, × 1; B, longitudinal section of mature fruit, showing seed, × 1. C-F, *Maniltoa minor*; C, distal portions of branchlets, with foliage and maturing inflorescences, × 1/3; D, fruit, × 2; E, inflorescence bud, × 4; F, flower, with 3 sepals, 3 petals, and several stamens removed, many anthers fallen, × 4. A from Smith 6382, B from Smith 843, C from Bryan 248, D from O. & I. Degener 32245, E from Smith 9700, F from Smith 1333.

rachis 1-1.5 cm. long, the pedicels 6-16 mm. long, the flower-subtending bracts about 12×2 mm.; sepals $5-7 \times 2-4$ mm.; petals $7-8 \times 1.5-2$ mm.; stamens 21-28, the filaments 8-15 mm. long, basally connate for about 1 mm. and sometimes also basally adnate to petals, becoming free; style 5-7 mm. long; mature fruits up to $2.7 \times 2 \times 1.2$ cm. 2. *M. minor*

Young branchlets and leaf petioles, rachises, and petiolules minutely puberulent (at least when juvenile in new flushes), often soon glabrate; inflorescences 15-50-flowered, the rachis and pedicels copiously puberulent, tomentellous, or hispidulous, the bracteoles 2-5 mm. long, dorsally copiously strigose or hispidulous, the sepals dorsally (often very inconspicuously) puberulent; stamens usually 25-40, the filaments separate to base; ovary (and style proximally) obviously strigillose or velutinous-hispidulous (hairs 0.1-0.3 mm. long).

Mature vegetative buds up to 11 cm. long, the largest scales 20-50 mm. long and broad, copiously stramineous-sericeous or -pilose dorsally (hairs 0.1-0.5 mm. long); indument of young parts stramineous; fully developed leaves (10-) 15-30 cm. long, the leaflets predominantly 3 (sometimes 2 or 4) pairs, the petiole 10-30 mm. long, the rachis (3-) 8-17 cm. long, the petiolules (1-) 2-7 mm. long; leaflet blades (6-) 9-11 \times 3-6.5 cm.; inflorescences 25-50-flowered, the rachis (1-) 2-3 cm. long, copiously cinereous-puberulent (hairs less than 0.3 mm. long), the pedicels 10-35 mm. long, copiously puberulent like rachis, the flower-subtending bracts up to 25×6 mm.; sepals $5-16 \times 2-8$ mm., dorsally inconspicuously puberulent; petals $7-17 \times 3-5$ mm.; filaments 15-30 mm. long; ovary (and style proximally) stramineous-strigillose; style 10-18 mm. long. 3. *M. floribunda*

Mature vegetative buds 3-4 cm. long, the largest scales 20-25 mm. long and broad, copiously ferruginous-puberulent dorsally (hairs to 0.1 mm. long); indument of young parts ferruginous; fully developed leaves 7-14 cm. long, the leaflets predominantly 2 (rarely 1) pairs, the petiole 8-18 mm. long, the rachis (of 2-jugate leaves) 1-4 cm. long, the petiolules 2-5 mm. long; leaflet blades $4-8 \times 2.5-4.5$ cm.; inflorescences 15-25-flowered, the rachis 1-2 cm. long, copiously ferruginous-tomentellous and -hispidulous (hairs 0.3-0.5 mm. long), the pedicels 10-20 mm. long, copiously tomentellous and hispidulous like rachis, the flower-subtending bracts $15-20 \times 2-3$ mm.; sepals $5-13 \times 3-5$ (-6.5) mm., dorsally copiously hispidulous-puberulent; petals $11-14 \times 2-3$ mm.; filaments 12-21 mm. long; ovary (and style proximally) ferruginous-velutinous-hispidulous and sometimes sparsely setulose; style 8-12 mm. long. 4. *M. vestita*

1. *Maniltoa grandiflora* (A. Gray) Scheffer in Ann. Jard. Bot. Buitenzorg 1: 20. 1876; Harms in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 1: 194. 1897, in Notizbl. Bot. Gart. Berlin 3: 191. 1902, in Bot. Jahrb. 55: 48. 1917; A. C. Sm. in Sargentia 1: 36. 1942, in J. Arnold Arb. 31: 167. 1950; J. W. Parham, Pl. Fiji Isl. 66. 1964, ed. 2. 101. 1972; van Meeuwen in Blumea 18: 38. 1970; A. C. Sm. in Allertonia 1: 399. 1978. FIGURE 25A.

Cynometra grandiflora A. Gray, Bot. U. S. Expl. Exped. 1: 470. 1854, Atlas, pl. 52. 1856; Seem. in Bonplandia 9: 255, p. p. 1861, Viti, 435, p. p. 1862, Fl. Vit. 71, p. p. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 159, p. p. 1890.

Maniltoa brevipes A. C. Sm. in J. Arnold Arb. 31: 168. 1950; J. W. Parham, Pl. Fiji Isl. 66. 1964, ed. 2. 101. 1972; A. C. Sm. in Allertonia 1: 400. 1978.

Maniltoa amicorum A. C. Sm. in Bishop Mus. Bull. 220: 132. fig. 11. 1959, in Allertonia 1: 400. 1978.

A tree 5-21 m. high occurring from near sea level to an elevation of 600 m. in dense, open, or dry forest, often along rocky coasts, sometimes on the inner edges of mangrove swamps, and often on limestone. The trunk frequently approaches 1 m. in diameter and the vegetative and inflorescence buds are at first glaucous-green, becoming brown. The fragrant flowers have white or cream-colored petals and filaments, and the fruits turn from purplish to brown. Flowers and fruits have been noted between May and January, but fruits probably persist throughout much of the year.

TIPIFICATION AND NOMENCLATURE: The type of *Cynometra grandiflora* is *U. S. Expl. Exped.* (US 62097 LECTOTYPE), collected in 1840 on Vanua Levu without further locality. The material studied by Gray seems to have come from three plants, and the specimen indicated is shown as *fig. B* in the 1856 illustration and apparently provided the floral details for Gray's description (Smith, 1942). Other Exploring Expedition specimens cited below are not isolectotypes. *Maniltoa brevipes* is based on *Smith 6600* (A HOLOTYPE; many ISOTYPES), collected Nov. 13, 1947, near the summit of Mt. Uluimbau, Mathuata Province, Vanua Levu. The type of *M. amicorum* is *Yuncker*

16168 (US 2128567 & 2157730 HOLOTYPE; ISOTYPES at BISH, BM), obtained May 25, 1953, above a coastal limestone cliff on the northwestern side of Vava'u, Tonga. The comparatively compact inflorescences with early glabrate bracts and the smaller, short-pedicellate flowers of *M. brevipes* and the compact inflorescences, small flowers, and prominent leaflet venation of *M. amicorum* are not sufficiently stable or consequential to permit separation of these taxa from a reasonable concept of *M. grandiflora*.

DISTRIBUTION: Fiji (known from nine islands, both high and low) and Tonga (known from several islands). About 35 Fijian collections are here referred and the species may be anticipated on many other islands in the archipelago. I have not seen the Solomon Islands specimen mentioned by Knaap-van Meeuwen (1970).

LOCAL NAMES AND USE: Fijian names referred to this species are *thimbithimbi*, *moivi*, *namo*, *yamo*, and *tongatu*; it is a desirable timber tree.

REPRESENTATIVE COLLECTIONS: VITI LEVU: Mba: Naloto Range, *DA 14764*; Thelau, west of Mba, *O. & I. Degener 32144*. NAITASIRE: Tholo-i-suva, *DA 13780 (DF 778)*. OVALAU: *U. S. Expl. Exped.* (GH, US; Gray's 1856 illustration as *fig. C*). WAKAYA: Southern peninsula (Wakaya lailai), *Bryan 615*. KORO: Eastern slope of main ridge, *Smith 1022*. VANUA LEVU: MATHUATA: Above Nasingasinga, *Berry 39*; Seangangga Plateau, *DA 14109*; vicinity of Lambasa, *Greenwood 423*. THAKAUNDROVE: Uluinambathi Mt., Savusavu Bay region, *Degener & Ordonez 13949*; near Tukavesi, Mbutha Bay, Natewa Peninsula, *Mead 1995*. VANUA LEVU without further locality, *U. S. Expl. Exped.* (GH; Gray's 1856 illustration as *fig. A*). TAVEUNI: Vicinity of Waiyevo, *Gillespie 4732*. KANATHEA: *Graeffe 1548*. ONGEA LEVU: *Bryan 436*. ONGEA NDRIKI: Rocky islet off northwest end, *Bryan 394*. FIJI without further locality, *Seemann 138*, p. (K).

2. *Maniltoa minor* A. C. Sm. in *Sargentia* **1**: 37. 1942, in *J. Arnold Arb.* **31**: 169. 1950; J. W. Parham, *Pl. Fiji Isl.* **66**. 1964, ed. 2. 101. 1972; van Meeuwen in *Blumea* **18**: 39. 1970; A. C. Sm. in *Allertonia* **1**: 400. 1978. FIGURE 24C-F.

Cynometra grandiflora sensu Seem. in *Bonplandia* **9**: 255, p. p. 1861, Viti, 435, p. p. 1862; non A. Gray. *Maniltoa cynometroides* sensu van Meeuwen in *Blumea* **18**: 39, solum quoad spec. vit. 1970; J. W. Parham, *Pl. Fiji Isl.* ed. 2. 101, p. p. 1972; non Merr. & Perry.

A tree 7–18 m. high, with a trunk up to 50 cm. in diameter, noted at elevations from near sea level to 250 m. in dense or dry forest. The petals and filaments are white. Insofar as specimens are dated, flowers have been collected in March and July, fruits in July and February.

TYPIFICATION: The type is *Smith 1333* (GH HOLOTYPE; many ISOTYPES), collected March 22, 1934, near Maloku, Moala.

DISTRIBUTION: Endemic to Fiji and thus far known definitely from seven of the islands.

LOCAL NAMES AND USE: Fijian names, generic in nature, applied to this species are *thimbithimbi*, *moivi*, and *namo*; the timber is locally used in housebuilding and is considered of commercial value by foresters.

AVAILABLE COLLECTIONS: MAMANUTHAS: NINGALITO Island, Malolo Group, *O. & I. Degener 32245*. VITI LEVU: SERUA: Inland from Korovisilou, *DA 13877 (DF 266; Bulai 2)*; flat coastal strip in vicinity of Ngaloa, *Smith 9700*; Navua River, below Namuamua, *DA 2463*. NAITASIRE: Vicinity of Tamavua, *Yeoward 52*; Experiment Station, Nasinu (cult.), *DA 1539*. KANDAVU: Wai-kerelo, Naikorokoro, *DF 1024 (S1553/5)*. OVALAU: Hills south of Levuka, *Gillespie 4540*. KORO: *Tothill 128A*, p. p. MATUKU: *Milne 121, Bryan 248, Tothill 127*. FIJI without further locality, *Seemann 138*, p. p. (BM, K), *Horne 294, Howard 159*.

3. *Maniltoa floribunda* A. C. Sm. in *J. Arnold Arb.* **31**: 169. 1950; J. W. Parham, *Pl. Fiji Isl.* **66**. 1964, ed. 2. 101. 1972; van Meeuwen in *Blumea* **18**: 37. *fig. 5*. 1970; A. C. Sm. in *Allertonia* **1**: 399. 1978. FIGURE 25B.

Cynometra grandiflora sensu Seem. in *Bonplandia* 9: 255, p. p. 1861, Viti, 435, p. p. 1862; non A. Gray.

Caesalpinia Seem. in *Bonplandia* 9: 255. 1861.

A tree 15–23 m. high (rarely noted as 3–4 m.), with a trunk to 70 cm. in diameter, occurring from near sea level to an elevation of 600 m. in dense, open, or dry forest, sometimes along rocky coasts. Bracts of the inflorescence buds are rich brown, the petals and filaments are pure white, and the ovary is pinkish, becoming brown as it matures. Flowers have been obtained between December and May, fruits between June and August.

TYPIIFICATION: The type is *Smith 4588* (A HOLOTYPE; many ISOTYPES), collected May 29, 1947, on the southern slopes of the Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, Nandronga & Navosa Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and now known from five or six islands; I now refer about 30 collections to *Maniltoa floribunda*. The ranges of this species and *M. grandiflora* are not discrete, although the former seems the more abundant on Viti Levu and Kandavu, the latter on Vanua Levu and in the Lau Group. The two species, readily distinguishable if inflorescences or young foliage is at hand, have very similar mature leaves.

LOCAL NAMES AND USE: The usual Fijian generic names have been noted: *thimbi-thimbi*, *moivi*, *yamo*, and *namo*. Like its relatives, the species produces a useful timber.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 1203*; vicinity of Tumbenasolo, valley of Namosi Creek, *Smith 4502*. NANDRONGA & NAVOSA: Near Nakalavo, north of Singatoka, *H. B. R. Parham 248*; vicinity of Mbalo, near Vatukarasa, *Degener 15317*. SERUA: Nathengathenga Creek, upper Navua River, *DF 1008 (S1553/2)*; hills between Waininggere and Waisese Creeks, between Ngaloa and Wainiyambia, *Smith 9516*. NAMOSI: Nambukavesi Creek, *DF 791*. NAITASIRE: Tholo-isuva Forest Reserve, *DF 778*; vicinity of Nasinu, *Gillespie 3507*. REWA: Between Lami and Suva, *Meebold 16655*; near coast west of Suva, *MacDaniels 1073 (Tothill 128)*. KANDAVU: *Seemann 131*; western end of island, near Cape Washington, *Smith 322*; vicinity of Naikorokoro, *DF 822*. "OVALAU or VANUA LEVU:" *Seemann 138*, p. p. (BM, GH, K). VANUA MBALAVU: Slopes of Korolevu, near Lomaloma, *Garnock-Jones 1031*. LAKEMBA: Near airport, *Garnock-Jones 875*.

4. *Maniltoa vestita* A. C. Sm. in *J. Arnold Arb.* 31: 170. 1950; J. W. Parham, *Pl. Fiji Isl.* 66. 1964, ed. 2. 102. 1972; A. C. Sm. in *Allertonia* 1: 399. 1978.

FIGURE 25C & D.

Maniltoa yokotai sensu van Meeuwen in *Blumea* 18: 38, solum quoad aliquot spec. vit. 1970; non Hosokawa.

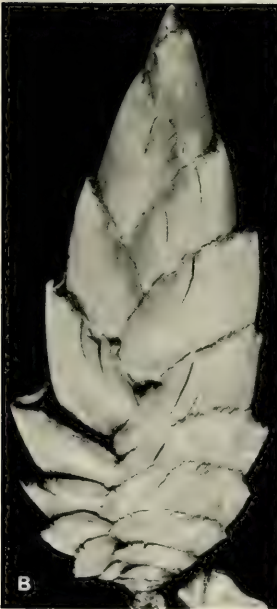
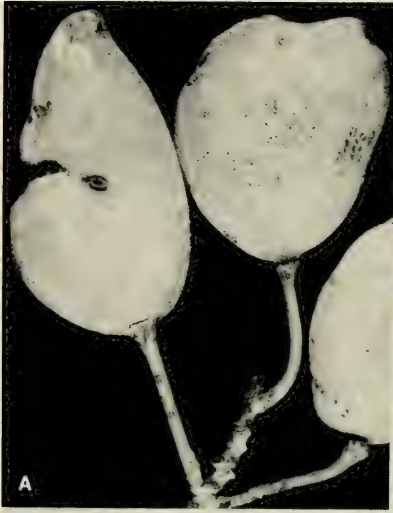
A tree 18–20 m. high, occurring at elevations of 200–500 m. in dense forest or thin forest on rocky slopes. The inflorescence bracts are whitish brown, becoming darker, and the petals, filaments, and style are white. Flowering specimens have been obtained in February, June, and November.

TYPIIFICATION: The type is *Smith 6442* (A HOLOTYPE; many ISOTYPES), collected Nov. 3, 1947, on the southern slopes of Mt. Numbuiloa, east of Lambasa, Mathuata Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and infrequent, known only from Viti Levu and Vanua Levu.

LOCAL NAMES AND USE: *Thimbithimbi*, *moivi*, and *namo* have been applied to the species, which is said to be a useful timber tree.

FIGURE 25. A, *Maniltoa grandiflora*; fruits, $\times 1$. B, *Maniltoa floribunda*; vegetative bud, $\times 1$. C & D, *Maniltoa vestita*; C, distal portion of branchlet, with foliage, an inflorescence, and 2 inflorescence buds, $\times 1/3$; D, flower, with 2 sepals and 3 petals removed, most anthers fallen, $\times 4$. A from *Bryan 615*, B from *Meebold 16655*, C from *DA 3209*, D from *Smith 6442*.



AVAILABLE COLLECTIONS: VITI LEVU: SERUA: Tumarua, inland from Ngaloa, *DF 1009 (S1553/3)*.
NAITASIRI: Prince's Road, *DA 3209*. FIJI without further locality, *Horne 922*.

14. *LYSIDICE* Hance in *J. Bot.* **5**: 298. 1867; Hutchinson, *Gen. Fl. Pl.* **1**: 244. 1964.

Tree, the stipules small, intrapetiolar; leaves paripinnate, the leaflets 3 or 4 pairs, opposite, acuminate, with a strong, continuous, usually glanduliferous marginal nerve; inflorescences axillary and terminal, paniculate, the peduncles with large, colored bracts at base, the bracteoles 2, showy; calyx tube (hypanthium) short, the sepals 4, narrowly imbricate, reflexed at anthesis; petals 3, equal, exerted, long-clawed; stamens 6, the filaments connate at base, 2 of them minute and with abortive anthers; ovary stipitate, the stipe adnate to hypanthium, the ovules about 12, the style long, circinate in bud, exerted at anthesis; fruit large, flat, apiculate, 2-valved, the valves twisting after dehiscence, the seeds compressed, transversely oblong.

TYPE SPECIES: *Lysidice rhodostegia* Hance.

DISTRIBUTION: Southern China and Vietnam, with a single species which is sometimes cultivated elsewhere.

1. *Lysidice rhodostegia* Hance in *J. Bot.* **5**: 299. 1867.

A small tree, sometimes up to 18 m. high where indigenous, sparingly cultivated in Fiji near sea level. The bracts are pink and conspicuous, the flowers pink to purple.

TYPIFICATION: Hance cites the type as *T. Sampson*, collected along a river near Canton, China.

DISTRIBUTION: As of the genus.

USE: An ornamental tree, known in Fiji only from an introduction garden and perhaps not persisting. It is known in cultivation in Africa, Singapore, New Guinea, Hawaii, and doubtless elsewhere. Where indigenous its not very durable timber is used for temporary articles, and the seeds are considered edible.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Experiment Station, Nasinu, *DA 1554*.

15. *SARACA* L. *Syst. Nat. ed. 12*: 2: 469. 1767, *Mant.* **13**, 98. 1767; Hutchinson, *Gen. Fl.*

Pl. I: 256. 1964; Zijderhoudt in *Blumea* **15**: 414. 1968; Verdcourt, *Man. New Guinea Leg.* **88**. 1979.

Trees or shrubs, with flaccid flushes of young leaves, the stipules adnate, enveloping buds but soon caducous; leaves paripinnate, the leaflets 1-7 pairs, opposite, the blades coriaceous or herbaceous, often with small glands near base and apex; inflorescences axillary or borne on branchlets or old wood, corymbose-paniculate, the bracts small, deciduous, the pedicels with a pair of subsistent, colored bracteoles, articulate above them; flowers ♀, sometimes functionally ♂; calyx tube (hypanthium) cylindrical, the sepals 4 (-6), conspicuous, petaloid, imbricate in bud; petals lacking; stamens (3-) 4-8 (-10), free, exerted, often partly abortive (staminodes dentate to subulate), the filaments elongate, the anthers oblong, dorsifixed, versatile; ovary stipitate, the stipe adnate to hypanthium, the ovules numerous, the style filiform, the stigma terminal, minute; fruit linear- to lanceolate-oblong, compressed, coriaceous to woody, dehiscent, the seeds 1-8, compressed, exarillate.

TYPE SPECIES: *Saraca indica* L.

DISTRIBUTION: India and southern China into Malesia to Celebes, with eight species (Zijderhoudt, 1968), some of which are cultivated elsewhere. One species is recorded from Fiji. Other students have considered the genus to include about 20 species; Verdcourt (1979) suggests that Zijderhoudt's revision takes a wide view of species circumscription.

USEFUL TREATMENT OF GENUS: ZUIJDERHOUDT, G. F. P. A revision of the genus *Saraca* L. (Legum.-Caes.). *Blumea* 15: 413-425. 1968.

1. *Saraca asoca* (Roxb.) de Wilde in *Blumea* 15: 393. fig. 1. A. 1968; Zijderhoudt in op. cit. 15: 422. 1968; Verdcourt, *Man. New Guinea Leg.* 88. 1979.

Jonesia asoca Roxb. in *Asiat. Res.* 4: 355. fig. 252, 253. 1799.

Saraca indica sensu J. W. Parham in *Agr. J. Dept. Agr. Fiji* 29: 33. 1959, *Pl. Fiji Isl. ed.* 2. 102. 1972; non L.

A tree 6-9 m. high, sparingly cultivated near sea level. The leaflets are usually 4-6 pairs, oblong-lanceolate, acuminate, and up to 25 cm. long. The flowers, fragrant during the night, have the pedicels subtended by yellow to red bracteoles 2-7 mm. long, these erect, clasping, and subsistent. The calyx is yellow to orange or red, purplish in and near the throat; the stamens have yellow to reddish filaments and grayish purple anthers. Our material bore flowers and fruits in July.

TYPIFICATION: Roxburgh's figures, from a plant cultivated in the Calcutta Botanic Garden, may be taken as the type; specimens from the Calcutta material are at BR in Herb. Martius.

DISTRIBUTION: India, Bangladesh, Burma, and Ceylon, often cultivated elsewhere. The species has often passed as *Saraca indica* L., indigenous from Thailand and Malaya to Java, which apparently is less frequently cultivated.

LOCAL NAMES AND USE: The names commonly used in India, *asok* and *asoka*, are utilized in Fiji, where the species is sometimes cultivated as an ornamental. *Saraca asoca* has been venerated as the sacred tree under which Buddha was borne.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Cocoa Station, Nanduruloulou, DA 12174. REWA: Suva Botanical Gardens, DA 17220.

16. *INTSIA* Thou. *Gen. Nova Madagasc.* 22. 1806; Meijer Drees in *Bull. Jard. Bot. Buitenzorg III.* 16: 87. 1938; Hutchinson, *Gen. Fl. Pl.* 1: 245. 1964; Brenan in *Fl. Trop. E. Afr. Leg. Caesalp.* 128. 1967; Verdcourt, *Man. New Guinea Leg.* 90. 1979.

Afzelia sensu Seem. *Fl. Vit.* 68. 1865; non Sm.

Trees, the stipules connate into an interpetiolar scale; leaves paripinnate, the leaflets (1-) 2-5 pairs, opposite or nearly so, the petiolules twisted, the blades not glandular-punctate but often with 1 or 2 basal glands beneath near petiolule; inflorescences terminal, corymbose-paniculate (rarely simply racemose), the bracts and bracteoles deciduous; calyx tube (hypanthium) elongate, the sepals 4, imbricate, the outer 2 enclosing the inner 2 in bud; petal 1 (2 lateral petals very rarely present, small or rudimentary), short-clawed, the blade orbicular to reniform, auriculate; fertile stamens 3, exserted, the filaments long, the anthers dorsifixed; staminodes 4-7, filiform, comparatively short, lacking anthers; ovary stipitate, the stipe adnate to hypanthium, the ovules several, uniseriate, the style elongate, exserted, the stigma terminal, convex-capitate; fruit compressed, slightly thickened at margin, tardily dehiscent, the valves thin-woody and reticulately transversely nerved, with transverse septa, the seeds few, compressed, exarillate, the funicle slightly fleshy.

LECTOTYPE SPECIES: *Intsia madagascariensis* Thou. ex DC. (vide Hutchinson, *Gen. Fl. Pl.* 1: 245. 1964) = *I. bijuga* (Colebr.) Kuntze.

DISTRIBUTION: Madagascar and coasts and islands of tropical eastern Africa to southern Asia and Formosa, eastward through Malesia and into the Pacific to Tonga and Samoa. In his treatment of 1938 Meijer Drees indicated the genus to be composed of nine species, but Cowan and Polhill (in *Adv. Leg. Syst.* 128. 1981) suggest that there are probably only three species. One widely distributed species is indigenous in Fiji.

USEFUL TREATMENT OF GENUS: MEIJER DREES, E. The genera *Intsia* and *Pahudia* (Legum.) in the Netherlands Indies. *Bull. Jard. Bot. Buitenzorg* III. 16: 83-102. 1938.

1. *Intsia bijuga* (Colebr.) Kuntze, *Rev. Gen. Pl.* 1: 192. 1891; Christophersen in *Bishop Mus. Bull.* 128: 98. 1935; Meijer Drees in *Bull. Jard. Bot. Buitenzorg* III. 16: 89. 1938; Yuncker in *Bishop Mus. Bull.* 220: 134. 1959; J. W. Parham in *Agr. J. Dept. Agr. Fiji* 29: 33. 1959, *Pl. Fiji Isl.* 64. *fig. 28, B.* 1964, ed. 2. 99. *fig. 29, B.* 1972; Brenan in *Fl. Trop. E. Afr. Leg. Caesalp.* 128. *fig. 23.* 1967; St. John & A. C. Sm. in *Pacific Sci.* 25: 328. 1971; B. E. V. Parham in *New Zealand Dept. Sci. Indust. Res. Inform. Ser.* 85: 44. 1972; Verdcourt, *Man. New Guinea Leg.* 91. *fig. 20.* 1979.

FIGURES 26, 27.

Macrobium bijugum Colebr. in *Trans. Linn. Soc.* 12: 359. *t. 17.* 1819.

Azelia bijuga sensu A. Gray, *Bot. U. S. Expl. Exped.* 1: 467, nom. illeg. 1854, *Atlas, pl. 51.* 1856; Seem. in *Bonplandia* 9: 255. 1861, *Viti,* 435. 1862, *Fl. Vit.* 69. 1865; Drake, *Ill. Fl. Ins. Mar. Pac.* 159. 1890; non (Willd.) Spreng. (1827).

A tree 7-24 (-42 elsewhere) m. high, with a trunk to 1 m. or more in diameter and with small buttresses, often abundant near sea level in coastal forests and thickets, along beaches, and on the inner edges of mangrove swamps; in dry forest it sometimes occurs inland up to an elevation of 450 m. The leaflets are usually 2 (rarely 1, very rarely 3) pairs, with blades usually not exceeding 15 × 9 cm. and obtuse to emarginate at apex. The fragrant flowers have the sepals pale green, the petal white or pale yellow proximally and pink to purple distally, the filaments and style red to purple, and the anthers rich purple. The oblong fruits usually do not exceed 20 × 6 cm. and for the most part produce 4-7 black seeds up to 3.5 cm. long. Flowers seem to occur between October and May, fruits between April and October.

TYPEIFICATION: The species was described from a plant cultivated at the Calcutta Botanic Garden; perhaps *Herb. Wallich 5823A*, from there, can be considered typical (Brenan, 1967).

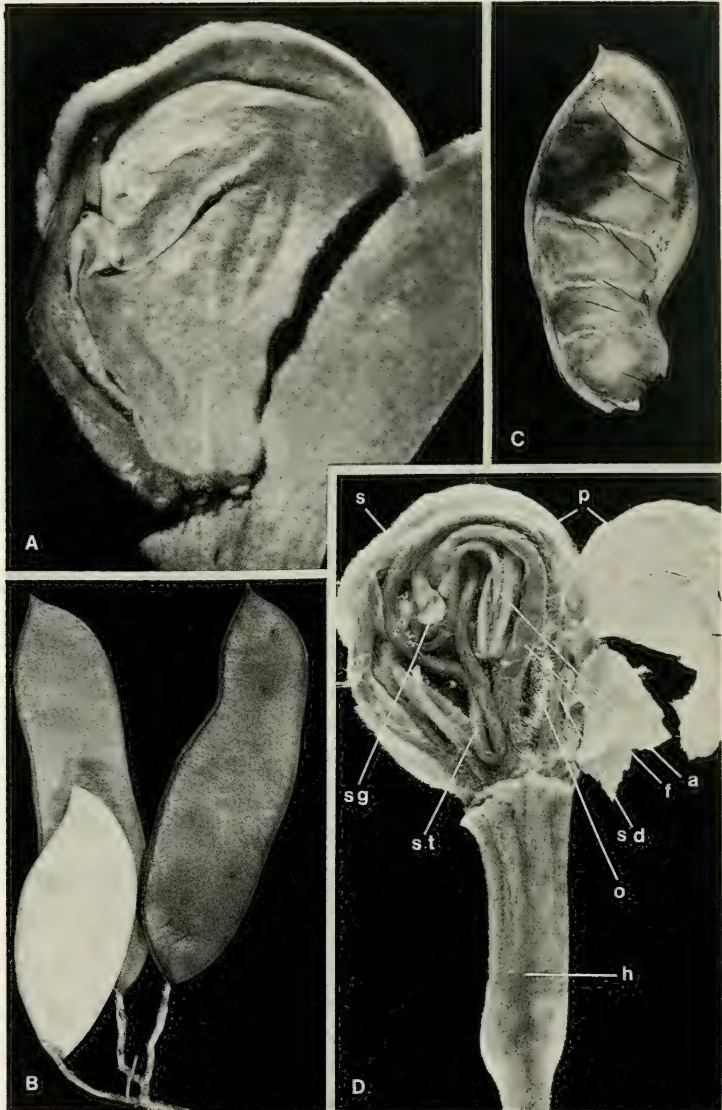
DISTRIBUTION: A widespread species with essentially the generic range. In his treatment of 1938 Meijer Drees described two forms, *glabra* and *hirsuta*, but these are usually considered local modifications of little consequence. I have examined about 55 collections from eleven islands, but the species doubtless occurs on most Fijian islands with appropriate habitats.

LOCAL NAMES AND USES: The names *vesi* and *vesiwai* are firmly attached to the species, which is one of the most useful and valued of trees in Fiji. It produces a durable hardwood suitable for heavy construction, boat building, flooring, and many other commercial purposes. Fijians value it for making yanggona bowls, canoes, houseposts, and headrests, and in earlier times made clubs from it. Medicinal uses are ascribed to the leaves for toothache and sore tongues, and the stem is sometimes part of an internal remedy for asthma. The tree is frequently cultivated in villages as an ornamental.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Yalombi, *St. John 18007*. VITILEVU: MBA: Vicinity of Tumbenasolo, valley of Namosi Creek, *Smith 4620*. NANDRONGA & NAVOSA: Mbulu, near Sovi Bay, *Degener 15031*. SERUA: Korovisilou, *DF 268*; Mburelotu, near Taunovo River, *DA 2869*. NAMOSI: Nambukavesi Creek, *DF 733*. NAITASIRE: Tholo-i-suva, *Vukicea*, Aug. 10, 1950. TAILEVU: Ndravuni, *DA 12471 (DF 120)*; Viwa Island, *Seemann 137*, p. p. REWA: Lami, *Parks 20908*; Nukulau Island, *Tothill 126A*. KANDAVU: *Seemann 137*, p. p.; Naikorokoro, *DF 838 (S1421/1)*. OVALAU: *U. S. Expl. Exped.*; Port Kinnaird, *Seemann 137*, p. p. KORO: Coastal thickets, *Smith 1038*. VANUA LEVU: MBUA: Ridge above

FIGURE 26. *Intsia bijuga*, from *Smith 1383*; A, distal portion of branchlet with foliage and a terminal inflorescence, and a detached partial inflorescence, × 1/3; B, mature flower, the 3 anthers fallen, × 1; C, distal part of style and stigma, × 20; D, lower part of flower with sepals turned down and some stamens removed, showing ovary, basal parts of 3 antheriferous filaments, staminodes, and claw of petal, × 10.





Thongea, Wainunu River, *DA 15784* (coll. *Berry*). MATHUATA: Natindoyanga Creek, Korovuli River, *DA 12904*; vicinity of Lambasa, *DF 841 (S1421/4)*. THAKAUNDROVE: East of Savusavu, *Bierhorst F190*; Tukavesi, Mbutha Bay, Natewa Peninsula, *Mead 1993*. TAVEUNI: Vicinity of Somosomo, *U. S. Expl. Exped. MOALA*: Naro'i, *Smith 1383*. VANUA MBALAVU: Near Namalata Village, *Garnock-Jones 1113*. FULANGA: On limestone formation, *Smith 1157*. ONGEA LEVU: In central forest, *Bryan 426*.

17. *KINGIODENDRON* Harms in Engl. & Prantl, *Nat. Pflanzenfam. Nachtr.* **1**: 194. 1897; B. L. Burt in *Kew Bull.* **1936**: 461. 1936; A. C. Sm. in *J. Arnold Arb.* **36**: 279. 1955; Hutchinson, *Gen. Fl. Pl.* **1**: 254. 1964; van Meeuwen in *Blumea* **18**: 46. 1970; Verdcourt, *Man. New Guinea Leg.* 93. 1979.

Trees, the stipules small, fugacious; leaves imparipinnate, the leaflets alternate (terminal ones rarely subopposite), (2-) 3-7 (very rarely only 1), the blades slightly inaequilateral, obscurely pellucid-punctate; inflorescences axillary, racemose-paniculate, the bracts and bracteoles minute, the pedicels short, the flowers small, ♀; calyx tube (hypanthium) short, with an inconspicuous marginal disk, the sepals 5, imbricate; petals lacking; stamens 10, exerted at anthesis, the filaments inflexed in bud, the anthers dorsifixed, dehiscent by introrse, longitudinal slits; ovary obscurely stipitate, the stipe adnate to hypanthium, the ovule 1, the style developed (but short) or negligible, the stigma truncate or minutely peltate; fruit ellipsoid to ovoid or obovoid, flattened when young, becoming greatly thickened, indehiscent, the pericarp at maturity hard and woody, with usually conspicuous longitudinal or reticulate nervation, the seed solitary, basal, the cotyledons strongly folded.

TYPE SPECIES: *Kingiodendron pinnatum* (Roxb. ex DC.) Harms (*Hardwickia pinnata* Roxb. ex DC.).

DISTRIBUTION: India to Malesia, the Solomon Islands, and Fiji, where an endemic species terminates the range, with six or more species.

1. *Kingiodendron platycarpum* B. L. Burt in *Kew Bull.* **1936**: 460. 1936; A. C. Sm. in *J. Arnold Arb.* **36**: 279. 1955; van Meeuwen in *Blumea* **18**: 49, *solum quoad spec. vit.*, excl. *fig. 7, b.* 1970; J. W. Parham, *Pl. Fiji Isl. ed. 2.* 101. 1972; A. C. Sm. in *Allertonia* **1**: 400. 1978.

FIGURES 28, 29.

Pterocarpus indicus sensu Seem. in *Bonplandia* **9**: 255. 1861, Viti, 435. 1862, *Fl. Vit.* 64. 1865; Drake, *Ill. Fl. Ins. Mar. Pac.* 156. 1890; non Willd.

A tree 8-35 m. high, occasional from near sea level to an elevation of 600 m. in dense forest and on its edges and in ridge forest; the trunk attains a diameter of 1.3 m. and is straight and clear for up to 15 m., terminated by a dense, wide-spreading crown. The floral parts are inconspicuously green to dull cream-colored, and the fruits turn from green to dull brown. Flowers have been obtained between January and March, fruits between May and October.

TYPIFICATION: The type is *Horne 483* (K HOLOTYPE; ISOTYPE at BO, ex van Meeuwen), collected in flower in March, 1878, on the island of Rambi.

DISTRIBUTION: Endemic to Fiji and known with certainty from five of the high islands.

LOCAL NAMES AND USE: The names *moivi* and *thimbithimbi*, also used for some related genera, are applied to this now well-known species. The hard wood was utilized by Fijians for many purposes and is now considered commercially valuable.

FIGURE 27. *Intsia bijuga*: A, flower bud (above hypanthium) with 2 sepals removed, showing blade of petal enclosing inner organs, $\times 10$; B, mature fruits, $\times 1/3$; C, inner surface of fruit valve, with 1 seed remaining attached, $\times 1/2$; D, flower bud with 3 sepals removed and half of young petal turned to right, $\times 6$, showing hypanthium (h), edge of sepal (s), blade of petal (p), filament of fertile stamen (f), anther (a), staminode (sd), ovary (o), style (st), and stigma (sg). A & D from *Smith 1383*, B from *Smith 1038*, C from *Bryan 426*.

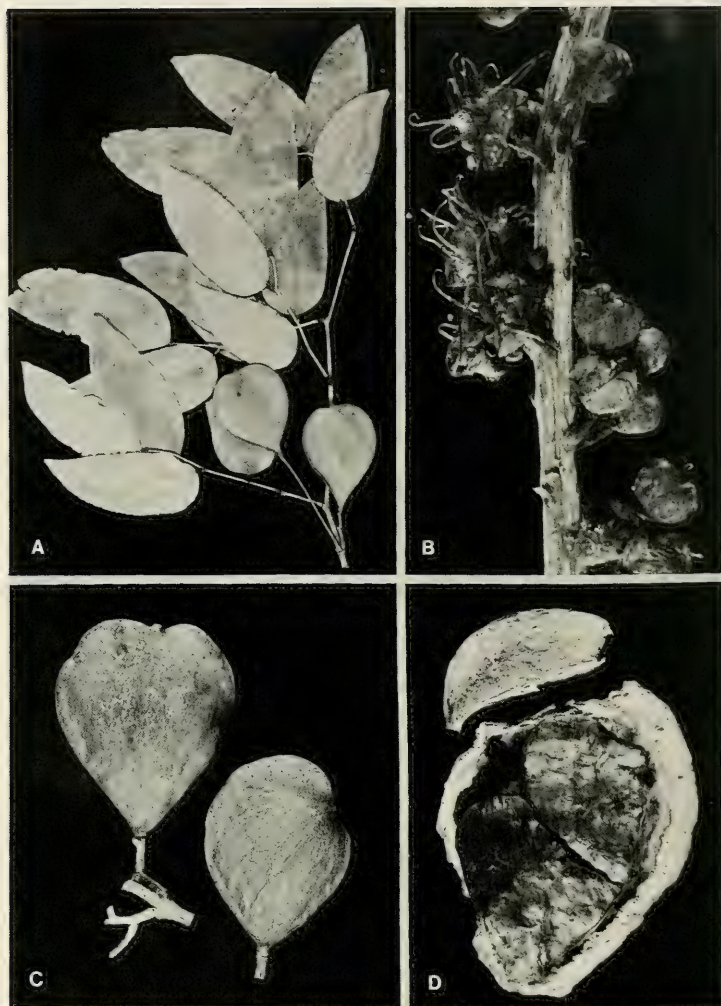


FIGURE 28. *Kingiodendron platycarpum*: A, distal portion of branchlet with flat, immature fruits, $\times 1/4$; B, portion of inflorescence branch and flowers, $\times 6$; C, mature fruits, showing variability in shape, $\times 1/2$; D, longitudinal section of broken mature fruit, showing a single basally attached seed (also broken), $\times 1$. A from Smith 7549, B from DF 269, C from Smith 9056 (left) and 8185 (right), D from Smith 8185.

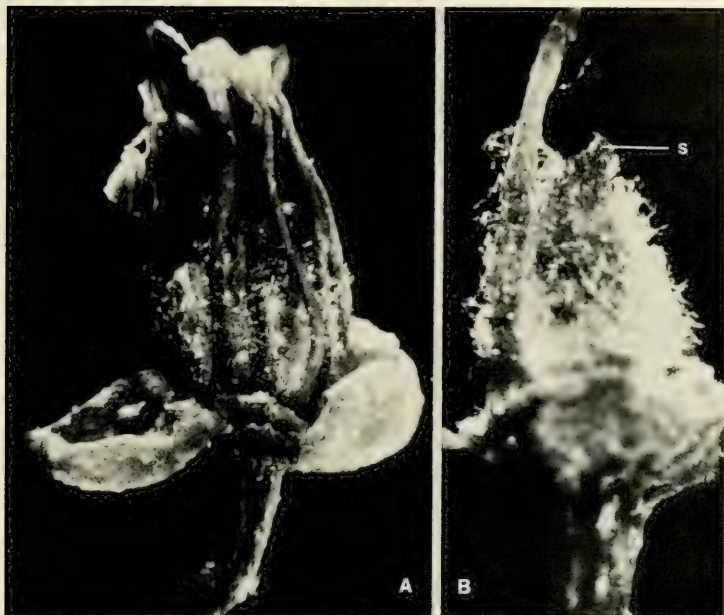


FIGURE 29. *Kingiodendron platycarpum*, from DF 269; A, flower with 1 sepal removed, the ovary concealed by filaments, $\times 25$; B, gynoecium, showing short style (s) and stigma, and basal part of a filament, $\times 40$.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mountains inland from Lautoka, *Greenwood 423C*. SERUA: "Serua coast," *Bulai 5*; vicinity of Korovisilou, *DF 269*; vicinity of Ngaloa, *DF 774, 931, Damanu G.10*. NAMOSI: Hills east of Wainikoroiluva River, near Namuamua, *Smith 9056*. NAITASIRI: Between Nasirotu (Waindina River) and Waimanu River, *DA L.12627* (coll. *Berry*). OVALAU: Valley of Mbureta and Lovoni Rivers, *Smith 7549*. VANUA LEVU: MBUA: "In dry part of district of Mbua near streams," *Horne 1121*. VANUA LEVU without further locality (probably Mbua Province), *H. B. R. Parham 387*. TAVEUNI: *Seemann 129*; slopes of Mt. Manuka, east of Wairiki, *Smith 8185*. FIJI without further locality, *DA L.13373* (*Berry 20*).

In her treatment of 1970 (in *Blumea* **18**: 46-50), Knaap-van Meeuwen indicated the occurrence of *Kingiodendron platycarpum* in Fiji, the Solomon Islands, and New Guinea, a conclusion with which I reluctantly agreed in 1978 (cited above). At that time I had not noted Verdcourt's perceptive comments (in *Kew Bull.* **32**: 244-246, 1977), expanded in his *Man. New Guinea Leg.* 93-98, 1979, indicating that *K. platycarpum* is endemic to Fiji.

Van Meeuwen's *fig. 7, b* shows a plant with presumably glabrous filaments, whereas those of the Fijian species are copiously pilose proximally (FIGURE 29A), and the style illustrated by her is at least 0.5 mm. long and tomentulose, whereas typical *Kingiodendron platycarpum* has the style negligible, only 0.1 mm. long, and glabrous (FIGURE 29B) in contrast to the copiously pilose ovary. The rachis and pedicels of the

Fijian species are glabrous (FIGURE 28B), not pubescent as described by van Meeuwen. Fruits of our species are comparatively broader than those described by van Meeuwen, 6–7 × 4.5–5.7 cm., flat and smooth (but thick-margined) when young, at maturity becoming 1.8–2 cm. thick and with strongly prominulous nerves that are reticulate (FIGURE 28C, right) rather than copiously and conspicuously longitudinally raised as in *K. novoguineense* Verdcourt.

The young fruits of species of *Kingiodendron platycarpum* (cf. FIGURE 28A) appear to be quite flat, but with development of the seed they thicken and acquire a characteristic nervation; young, flat fruits apparently do not provide dependable characters in the genus. Verdcourt suggests that in some cases developed and obsolete styles may indicate ♀ and ♂ states, but in at least *K. platycarpum* the essentially obsolete style bears a minutely peltate and apparently receptive stigma, and the ovule appears to be functional.

18. *BROWNEA* Jacq. Enum. Syst. Pl. Carib. 6, as *Brownaea*. 1760; corr. Murray, Syst. Veg. ed. 13. 516. 1774; Hutchinson, Gen. Fl. Pl. 1: 271. 1964; Verdcourt, Man. New Guinea Leg. 103. 1979. Nom. et orth. cons.

Small trees, the flushes of young leaves flaccid, pink to red, subtended by large, marcescent perules, the stipules foliaceous or colored, caducous; leaves paripinnate, the leaflets often large, the blades usually acuminate and with a gland at base beneath; inflorescences usually densely capitate, terminal, axillary, or borne on branchlets and old wood, the bracts often large and caducous, the bracteoles colored, conspicuous, connate into a bilobed tube enclosing the calyx; calyx tube (hypanthium) tubular, the sepals 4 (or 5), petaloid, imbricate; petals (4 or 5), slightly unequal, ovate to oblong, clawed, imbricate; stamens 10–15, the filaments connate at base or into a tube; ovary stipitate, the stipe adnate to hypanthium, the ovules numerous, the style filiform, the stigma capitate-dilated; fruit oblong, compressed, coriaceous to woody, dehiscent, the seeds transverse, compressed.

TYPE SPECIES: *Brownea coccinea* Jacq.

DISTRIBUTION: Tropical America, with 25–30 species, several of which are in widespread cultivation; one or two species are grown in Fiji.

1. *Brownea* spp.

Small cultivated trees, with red to scarlet flowers in large, showy inflorescences usually axillary or borne on older branches.

LOCAL NAME AND USE: A name applied in Fiji is *rose of Venezuela*; species of the genus are beautiful additions to many tropical botanical gardens.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Nanduruloulou, DA, April 20, 1949 (SUVA). FIJI without further locality, DA 3453 (SUVA).

In the absence of a recent revision of the genus, the identities of the several species of *Brownea* recorded as cultivated in various tropical areas remain questionable (as noted by Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 16. 1967, and Verdcourt, Man. New Guinea Leg. 104. 1979). Cultivated hybrids further complicate identification. Whether one or two species are cultivated in Fiji remains to be resolved; two have been recorded. Five species are said to be in cultivation in Hawaii and three in Java.

Brownea grandiceps Jacq. (Collect. 3: 287. t. 22, fig. a-i. 1891), typified by a collection made (by Loeffling?) near Caracas, Venezuela, was listed in Thurston's 1886 *Catalogue* as being cultivated in Fiji. J. W. Parham (Pl. Fiji Isl. 62. 1964, ed. 2. 96. 1972) also recorded *B. grandiceps*, presumably represented by the two specimens cited above.

Brownea coccinea Jacq. (Enum. Syst. Pl. Carib. 26, as *Brownaea c.* 1760, Select. Stirp. Amer. 194. t. 121. 1763) was listed by J. W. Parham (in Agr. J. Dept. Agr. Fiji 19: 90. 1948) as being cultivated in the Suva Botanical Gardens, but no voucher has been seen. The species is typified by Jacquin specimens from Venezuelan coastal forest.

19. TAMARINDUS L. Sp. Pl. 34. 1753; Hutchinson, Gen. Fl. Pl. 1: 246. 1964; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 151. 1967; Verdcourt, Man. New Guinea Leg. 106. 1979.

Tree, the stipules lanceolate, fugacious; leaves paripinnate, the leaflets opposite, small, in numerous pairs, subsessile, asymmetric at base; inflorescences terminal and lateral, racemose, lax, the bracteoles valvate, enclosing flower buds but soon caducous; flowers ♂, zygomorphic; calyx tube (hypanthium) narrowly turbinate, the sepals 4, broadly imbricate; petals 5, the 3 upper ones subequal, imbricate, the 2 lower ones minute, setaceous or scallike; perfect stamens 3, the filaments connate about half their length into a sheath, the anthers dorsifixed; staminodes 4 or 5, dentate, borne between antheriferous filaments at apex of filament sheath; ovary stipitate, the stipe adnate to hypanthium, the ovules 8–14, the style elongate, the stigma subcapitate; fruit oblong to linear, curved or straight, thick, sometimes irregularly constricted between seeds, indehiscent, septate between seeds, the mesocarp pulpy, the seeds embedded in pulp, compressed, areolate.

TYPE SPECIES: *Tamarindus indica* L.

DISTRIBUTION: Tropical Asia and Africa, with a single species so widely cultivated that its precise origin (probably African) is uncertain.

1. **Tamarindus indica** L. Sp. Pl. 34. 1753; Seem. Fl. Vit. 74. 1865; Yuncker in Bishop Mus. Bull. 178: 59. 1943, in op. cit. 220: 134. 1959; J. W. Parham, Pl. Fiji Isl. 67. 1964, ed. 2. 102. 1972; Brenan in Fl. Trop. E. Afr. Leg. Caesalp. 153. fig. 32. 1967; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 56. 1970; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 120. 1972; Verdcourt, Man. New Guinea Leg. 108. fig. 25. 1979.

Tamarindus indicus L. ex J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 91. 1948, in op. cit. 29: 33. 1959.

A tree (up to 25 m. high where well established) with a rounded crown, occasionally cultivated near sea level or naturalized near seashores; the leaves have 10–21 pairs of leaflets about 1–3 × 0.5–1 cm. The flower buds are red, the sepals reddish without and pale yellow within, and the petals slightly larger than sepals, yellow or cream-colored, with red or purple veins. The fruits are 6–20 cm. long and 2–3 cm. in diameter, with 1–10 seeds up to 17 × 12 mm. Our specimens bore flowers in January and February, fruits in May.

TYPIFICATION: Several references are given by Linnaeus, but a lectotypification has not been noted.

DISTRIBUTION: As of the genus. The *tamarind* was already in cultivation in Fiji at the time of Seemann's visit, but he did not collect it.

LOCAL NAMES AND USES: Names used in Fiji are *tamarind*, *tamalina*, *imli* (Hindi), and *puli* (Tamil). The acid pulp of the fruit may be used fresh in beverages or preserved for jams, chutney, etc.; the seeds are also edible. The species is often used as an ornamental street tree. Many medicinal and other uses are detailed by Burkill (Dict. Econ. Prod. Malay Penins. ed. 2. 2159–2162. 1966) and Pursglove (Trop. Crops, Dicot. 204–206. fig. 30. 1968).

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Ndreketi Inlet, south of Lautoka, DA 11407. TAILEVU: Along Wainimbokasi River, near Hospital, DA 1003. REWA: Suva Botanical Gardens, DA 12067. FIJI without definite locality ("Avatele"), DA 4038.

FAMILY 125. FABACEAE

FABACEAE Lindl. Nat. Syst. Bot. ed. 2. 148. 1836.

Papilionaceae Giseke, Prael. Ord. Nat. Pl. 415. 1792. Nom. alt.

Trees, shrubs, or herbs, sometimes climbing or decumbent, usually stipulate, the stipules free or adnate to petioles; leaves alternate or rarely opposite, usually compound (impari- or paripinnate, trifoliolate, digitate, or unifoliolate, never bipinnate), rarely simple, with or without stipels; inflorescences terminal or axillary, racemose, paniculate, or capitate, rarely spicate, sometimes 1-flowered; flowers zygomorphic (very rarely essentially actinomorphic, as in *Inocarpus* among our genera), usually ♂, very rarely cleistogamous; calyx gamosepalous, (4- or) 5-dentate or -lobed, bilabiate, or rarely spathaceous, the lobes or teeth imbricate or valvate; petals 5 (rarely absent), imbricate, free or rarely partially connivent, the adaxial one (standard or vexillum) outermost, the two lateral ones (wings or alae) parallel with each other, the two lower ones innermost, often joined to form a keel (carina); disk rarely present; stamens inserted with petals, often 10, rarely fewer, monadelphous or diadelphous, rarely all free, the adaxial (vexillary) filament often free or partially united with the others, the anthers basifixed or dorsifixed, usually dehiscing lengthwise, rarely dimorphic; ovary free, unilocular or rarely transversely or longitudinally septate, the ovules 1-numerous, inserted on adaxial suture; fruit dehiscent by one or both sutures or indehiscent, sometimes winged, sometimes articulate (jointed) and breaking up into 1-seeded segments (articles), the seeds without pleurograms (areoles) and (if hard) with a hilar groove, without or with very scant endosperm, sometimes strophiolate or carunculate, the radicle usually incurved.

DISTRIBUTION: Worldwide, with about 443 genera and 12,000 species. In Fiji 63 genera are now recorded, 19 of them having indigenous species.

USEFUL TREATMENTS OF FAMILY: HUTCHINSON, J. Fabaceae. Gen. Fl. Pl. 1:297-489. 1964. VERDCOURT, B. Studies in the *Leguminosae-Papilionoideae* for the 'Flora of Tropical East Africa': 1-V. Kew Bull. 24: 1-70, 235-307, 379-447, 507-569. 1970; 25: 65-169. 1971. GILLET, J. B., R. M. POLHILL, & B. VERDCOURT. Leguminosae Subfamily Papilionoideae, 1-1108. 1971. In: Milne-Redhead, E., & R. M. Polhill (eds.). Fl. Trop. E. Afr. SMARTT, J. Tropical Pulses. 348 pp. Longman, 1976. RUDD, V. E. Fabaceae. In: Dassanayake, M. D., & F. R. Fosberg (eds.). Rev. Handb. Fl. Ceylon 1: 428-458. 1980.

Species with potential as useful agricultural plants that have been introduced into Fiji in recent years have been listed, together with their sources, in *Plant Introduction Lists* (now approximately 30 in number) prepared by the Fiji Department of Agriculture. Numbers assigned to these introductions, now more than 20,000, are indicated as "FDA" numbers. Herbarium specimens have often been prepared from such plants growing in introduction plots, the specimens then bearing the usual "DA" numbers (sometimes but not always accompanied by the corresponding "FDA" number).

Potential forage legumes or leguminous cover crops or pulse crops are numerous in the "FDA" series, and many of them have been listed in the more strictly botanical literature (e. g., J. W. Parham, 1964, 1972) and hence included in the present *Flora*; for the most part there seems a reasonable chance that such species have or will become established and naturalized. Other legumes known only from introduction plots under "FDA" numbers, lacking herbarium vouchers of any sort and not listed in any botanical treatment known to me, probably will not become naturalized and hence are omitted from the present *Flora*. Into this category fall taxa listed under such generic names as *Cytisus*, *Lotus*, *Trifolium*, *Voandzeia* (= *Vigna*), etc. Genera such as *Trifolium*, *Vigna*, and *Phaseolus* are indeed included in the present *Flora*, but some of the "FDA" introductions of them (and of other fabaceous genera) were listed under dubiously correct specific names that it has not seemed worthwhile to track to a logical synonymy.

The sequence of genera here utilized is taken from the various treatments in *Advances in Legume Systematics* (1981), and the following key to tribes is in large part taken from Polhill's key in that work (pp. 205-208); however, the tribal circumscriptions here outlined are based only on genera that occur in Fiji and do not connote all the variation inherent in the tribes as understood by Polhill and his collaborators.

KEY TO TRIBES OCCURRING IN FIJI

Stamens free or shortly connate at base; calyx lobes subequal or the upper pair connate; leaves imparipinnate; fruits not jointed; petals 5; our representatives trees or shrubs. 1. SOPHOREAE
Stamens joined to a considerable degree.

Anthers (at least in our genera) dimorphic, alternately basifixed (longer ones) and versatile (shorter ones); leaves estipellate, digitately 3(-7)-foliolate, sometimes simple or 1-foliolate, usually pulvinate, not glandular-punctate; fruits not articulate; calyx with 5 subequal lobes or with the lateral sinuses shallower or the upper sinus deeper, the calyx sometimes 2-lipped; seeds conspicuously arillate or not; filaments connate into a sheath open on upper side. 14. CROTALARIEAE

Anthers essentially uniform at least in size, some sometimes aborted, or if anthers dimorphic then leaves pinnate or glandular-punctate.

Leaves with pulvinus lacking (stipules often adnate to petiole base) or reduced (visible but not swollen), often then with a stipular ridge forming an abaxial commissure, generally distichous or crowded, estipellate; inflorescences axillary; herbs (all our genera).

Nerves extending to the more or less toothed margin of leaflet blades.

Stipules free from petiole; leaves 3-36-foliolate, ending in a tendril, spine, or leaflet; seeds globose to ovoid, beaked, with a very short radicle; our representative a cultivated annual herb, glandular-viscid, the leaves imparipinnate and usually with 9-14 leaflets, the flowers solitary, the seeds edible. 12. CICEREAE

Stipules adnate to petiole; leaves in our genera 3(-7)-foliolate; seeds small, with a well-developed radicle. 13. TRIFOLIEAE

Nerves looped within margin of leaflet blades; leaves usually paripinnate, ending in a tendril or bristle, rarely imparipinnate; stipules free from petiole, often foliaceous; seeds lenticular to globose, with a more or less linear hilum and no radicular lobe. 11. VICIEAE

Leaves pulvinate, mostly free from stipules (if present).

Petals all similar, linear; fruits 1-seeded, indehiscent, drupelike; flowers sessile or subsessile.

3. DALBERGIEAE (*Inocarpus*)

Petals differentiated, the flowers papilionoid.

Upper 2 calyx lobes greatly enlarged, separate to base, petaloid, the lower 3 lobes minute; ovary 1-ovulate; leaves paripinnate; radicle short, straight; our genus represented in Fiji by a cultivated tree, the leaves with a winged rachis, the flowers rose-pink, the fruit indehiscent.

2. DIPTERYXAE

Upper calyx lobes not so enlarged (or if enlarged then forming a lip and not separate to base).

Stamens 9; leaves paripinnate; flowers in pseudoracemes (pedicels several at rachis node) or axillary fascicles; fruits elastically dehiscent, with brown to bright-colored, often bicolored seeds; a tribe composed of a single genus, our representative an indigenous, often frequent, littoral scrambling vine or scandent shrub with 16-40 small leaflets and red and black seeds.

4. ABREAE

Not as above.

Anthers apiculate (in our genera) or appendaged; petals usually reddish and caducous; biramous hairs present (often among others). 7. INDIGOFERAE

Anthers not appendaged.

Fruits transversely articulate, sometimes composed of only 1 article, or less often opening down 1 suture (then tertiary venation of leaflet blades scalariform); seeds with radicular lobe longer than cotyledonary lobe; lower petals generally withering and caducous after explosive pollen release; inflorescences generally compound with more than 1 series of bracts; leaves pinnately 3(-5)-foliolate or 1-foliolate, generally stipellate; stipules and bracts often striately nerved; uncinat or microscopically glochidiate hairs generally present. 8. DESMODIEAE

Fruits not articulate, or if so (*Aeschynomeneae*) then seeds more symmetrical; lower petals more retractible or a little interconnected and differentiated.

Hypanthium none; intrastaminal disk generally present; vexillary filament free or often connate medially but then free, arched, and thickened to form openings at base of filament sheath; flowers often in pseudoracemes, sometimes in extensive panicles or

clustered in axils; leaves generally imparipinnate, 3-many-foliolate, often stipellate, the leaflets generally strictly opposite, occasionally alternate, or the leaves sometimes 1-foliolate or simple; fruits not articulate.

Leaves 1-many-foliolate (but never 1-foliolate in our species), if 3-foliolate then the lateral leaflets often only slightly asymmetrical; stipels often lacking; trees, shrubs, or lianas, with hard wood, less often (*Tephrosia*) subshrubs with soft wood or herbs; flowering (except *Tephrosia*) often massive, the inflorescences often aggregated toward ends of branches; seeds with rudimentary plumule.

5. TEPHROSIEAE

Leaves (1-)3-foliolate, stipellate or less frequently estipellate, the lateral leaflets usually markedly asymmetrical, or the leaves occasionally 5-9-foliolate; twining, prostrate, or erect herbs, sometimes shrubs, trees, or lianas; flowering generally protracted, the inflorescences often in many axils; flowers often as in Tephrosieae but with a tendency toward elaboration in style, standard appendages, abortion of anthers, resupination, and bird-pollination; seeds generally with a well-developed plumule unless endosperm thick. 9. PHASEOLEAE

Hypanthium present, short to long; disk usually lacking; vexillary filament not forming openings at base of filament sheath; flowers almost always inserted singly if inflorescence extended; leaves variously paripinnate to imparipinnate, with or without stipels, the leaflets alternate to opposite, or the leaves sometimes 1-3-foliolate.

Fruits articulate unless geocarpic. 10. AESCHYNOMENEAE

Fruits not articulate nor buried by an elongating gynophore.

Ovules 1-4; fruits indehiscent, the seeds generally in separate seed chambers with hard endocarp; keel petals overlapping abaxially (or if margins adnate then flowers usually secund on rachis), more or less free from wings; stamens often shortly and/or irregularly joined. 3. DALBERGIEAE

Ovules generally more numerous; fruits generally more podlike, dehiscent (sometimes tardily so), often septate; flowers in axillary racemes (or these clustered at older nodes); stamens about 3/4 joined. 6. ROBINIEAE

KEYS TO GENERA

TRIBE 1. SOPHOREAE

Lower petals essentially similar, pinnately nerved; calyx with subequal lobes; anthers in our representatives 3-5 mm. long; cultivated only.

Fruits compressed, indehiscent, narrowed and 2-winged proximally, swollen and usually 1-seeded distally; lateral petals outside lower petals and about as long as stamens; ovules 2; leaflet blades with pellucid dots and streaks. 1. *Myroxylon*

Fruits essentially terete, turgid, woody, dehiscent, few-seeded, not winged; lateral petals much shorter than stamens; ovules 6 or 7; leaflet blades not pellucid-glandular. 2. *Castanospermum*

Lower petals differentiated into wings and keel, palmately nerved; calyx with lobes subequal or the upper 2 somewhat connate; anthers in our representatives about 1 mm. long.

Fruits oblong to orbicular; calyx lobes imbricate; stigma lateral and introrse; our species a cultivated tree, the leaves with 7-11 leaflets (blades coriaceous, ovate to oblong, acute to acuminate at apex), the petals dark purple, the seeds bicolored red and black. 3. *Ormosia*

Fruits moniliform, strongly constricted between seeds; calyx lobes valvate; stigma minute, terminal; our species an abundant, coastal, indigenous tree or shrub, the leaves with 9-21 leaflets (blades chartaceous, broadly elliptic to suborbicular, rounded at apex), the petals yellow, the seeds unicolored, pale brown. 4. *Sophora*

TRIBE 2. DIPTERYXAE

One genus only in Fiji. 5. *Dipteryx*

TRIBE 3. DALBERGIEAE

Flowers papilionoid, zygomorphic; filament sheath not adnate to petals; leaves imparipinnate (rarely unifoliolate but not in our representatives).

Fruits not winged; wing petals not much broader or longer than keel petals; petals not yellow.

Keel petals overlapping beneath; fruits drupaceous; our species a cultivated tree, with pink to purple-red petals. 6. *Andira*

Keel petals connate (not overlapping) on lower side toward apex; fruits samaroid; our species an indigenous, littoral, scrambling liana or sprawling shrub, with white petals. 7. *Dalbergia*

Fruits narrowly to broadly winged; wing petals expanded, usually longer than keel petals; petals yellow to orange; our species a cultivated tree. 8. *Pterocarpus*

Flowers with 5 (4-6) linear petals, essentially actinomorphic, the petals connate into a tube proximally; leaves simple (with 1 pulvinus); flowers sessile or subsessile; calyx closed in bud; filaments connate into a tube adnate to base of petals, the anthers subsessile at 2 levels on the tube; fruits indehiscent, drupe-like, large; our species a large, primarily coastal, indigenous tree, often with a massive trunk, the seed edible. 9. *Inocarpus*

TRIBE 4. ABREAE

One genus only. 10. *Abrus*

TRIBE 5. TEPHROSIEAE

Leaflet blades with curved secondary nerves not reaching a well-defined marginal nerve; trees, shrubs, or lianas; pedicels with bracteoles, but these often soon caducous; fruits indehiscent (or very tardily dehiscent), membranous to subligneous, not soft, sometimes winged (those of our species orbicular or elliptic to linear-lanceolate, very rarely less than 1 cm. broad, and rarely with more than 4 seeds).

Inflorescences terminal and axillary, paniculate, pseudopaniculate, or pseudoracemose, the flowers often crowded on short lateral branchlets or fasciculate at nodes; fruits membranous to thin-coriaceous at maturity, narrowly winged or not, the seeds 1-few.

Fruits winged along upper suture or both sutures; flowers clustered or crowded on short lateral branchlets or pseudoracemes or pseudopanicles or fasciculate at nodes; our species indigenous or cultivated and sometimes naturalized. 11. *Derris*

Fruits in our species very narrowly winged along upper suture (in most species not winged); flowers in our species paired at apices of short lateral branchlets of axillary pseudoracemes; our species a cultivated tree. 12. *Lonchocarpus*

Inflorescences axillary, racemose (racemes sometimes grouped into a panicle), the flowers 2 (rarely 3) at nodes; fruits thick-coriaceous to subligneous at maturity, not winged, the seed 1 (rarely 2 or 3); an indigenous tree seldom found far from coasts. 13. *Pongamia*

Leaflet blades comparatively small (in our species 1.5-4 × 0.3-1 cm.), with numerous (in our species 6-17), nearly straight, ascending, parallel lateral nerves extending to margin, and often with a well-developed marginal nerve; herbs or small shrubs with soft wood; inflorescences usually terminal or leaf-opposed, less often axillary, the pedicels without bracteoles; fruits dehiscent, often explosively so, soft, not winged (those of our species linear, 3-5.5 cm. long, 3-6 mm. broad, with 5-14 seeds); our species indigenous or cultivated. 14. *Tephrosia*

TRIBE 6. ROBINIEAE

Leaves imparipinnate, the leaflets in our species 7-17 pairs, with blades 3-6 × 1.5-3.5 cm.; racemes often clustered at older nodes; bracteoles absent; fruits linear-oblong, compressed, not septate, with valves becoming spirally coiled after dehiscence; fruits in our species up to 15 × 1.5 cm., with 3-8 seeds; cultivated only. 15. *Gliricidia*

Leaves paripinnate, the leaflets numerous, in our species (4-) 7-55 pairs, with blades 0.4-4.2 × 0.15-1.4 cm.; racemes axillary; bracteoles present but usually fugacious; fruits linear, often becoming subterete, transversely septate, with valves not coiled after dehiscence; fruits in our species 1.3-6 × 0.2-0.9 cm., with 6-50 seeds; our species indigenous, cultivated, naturalized, or adventive. 16. *Sesbania*

TRIBE 7. INDIGOFERAE

Vexillary filament free; standard (at least in our taxa) dorsally pilose, not distinctly veined; fruits usually subterete; leaflets (in our taxa) 5-19, the blades entire; adventive, naturalized, or cultivated. 17. *Indigofera*

Vexillary filament attached at least lightly to filament tube; standard glabrous, strongly veined; fruits flat, in our species with 3 longitudinal ridges; leaflets in our species 3, the blades sparsely serrate; cultivated only. 18. *Cyamopsis*

TRIBE 8. DESMODIEAE

Ovary in our genera 2-many-ovulate (very rarely 1-ovulate); fruits very rarely 1-seeded; small uncinuate hairs generally present, together with straight hairs; leaves stipellate; secondary lateral nerves more or less suppressed, the tertiary venation often scalariform; standard without inflexed auricles.

Calyx not glumaceous nor striate; articles or complete fruits usually more convex on lower than on upper side.

Leaves 3(-5)-foliolate or 1-foliolate, the leaflet blades longer than broad (or sometimes suborbicular); calyx neither accrescent nor reticulate-veined.

Fruits not folded nor enclosed within calyx; leaflets 1 or 3, rarely 5, the blades with lateral nerves not extending to margin; pedicels not hamate; flowers not twisted.

Inflorescences axillary, subumbellate to congested-racemose; flowers solitary in axils of bracts; secondary bracts lacking; bracteoles paired at base of calyx, comparatively large and distinct under buds and young flowers; petals white or pale yellow; androecia monadelphous; styles more than 5 times longer than ovaries; fruits indehiscent, thick-corky or coriaceous, glabrous to variously pilose but lacking uncinuate hairs, at length separating into articles; seeds rim-arrilate; indigenous. 19. *Dendrobium*

Inflorescences terminal or axillary, racemose or paniculate (rarely subumbellate or fasciculate); flowers borne in fascicles of 2-several or infrequently solitary on rachis; secondary flower-subtending bracts often present; bracteoles lacking or minute at base of calyx; petals purplish, reddish, blue, or pink, sometimes shading to white; androecia sometimes diadelphous (vexillary filament often free to middle or to base); styles not much longer than or shorter than ovaries; fruits often with uncinata hairs; cultivated (and often naturalized) or adventive.

Fruits distinctly articulate, often reticulate-nerved, the articles at length separating from each other, indehiscent or rarely dehiscent on lower suture; seeds inconspicuously rim-arillate around hilum (in all our species); secondary flower-subtending bracts usually present; bracteoles at base of calyx sometimes present but minute; keel petals without appendages; terminal leaflet blades somewhat larger than lateral ones, but these occasionally lacking and the leaf unifoliolate. 20. *Desmodium*

Fruits not articulate nor reticulate-nerved, dehiscent along the undulate lower suture; seeds conspicuously arillate around hilum; secondary flower-subtending bracts lacking; bracteoles absent; keel petals appendaged dorsally at base of lamina; terminal leaflet blades much larger than lateral ones, these often lacking and the leaf unifoliolate.

21. *Codariocalyx*

Fruits folded (in our species usually with 2 but sometimes with only 1 article) and mostly enclosed within the persistent calyx at maturity; leaflets in our species 1 or 3, the blades with lateral nerves extending to margin; pedicels usually paired, hamate (apically hooked); flowers often twisted; indigenous. 22. *Uraria*

Leaves 1- or 3-foliolate, the terminal (or only) leaflet blade in our species much broader than long; calyx nearly as long as petals, accrescent and persistent after flowering, papyraceous, reticulate-veined, the lobes deltoid; fruits deeply constricted between articles, folded and enclosed within calyx at maturity; cultivated and naturalized. 23. *Christia*

Calyx glumaceous, the lobes striate with conspicuous nerves; fruits subterete or slightly compressed, articulate, the articles symmetrical along upper and lower margins (in our species short-cylindric and truncate at ends); leaves in our species unifoliolate, the petiole channelled and narrowly winged; adventive. 24. *Alysicarpus*

Ovary 1-ovulate; fruits 1-seeded, indehiscent; uncinata hairs absent; leaves estipellate; secondary lateral nerves well formed, the tertiary venation reticulate; standard usually with inflexed auricles; our species an infrequently cultivated potential fodder plant, with very small leaves and inconspicuous, 2-4-flowered inflorescences. 25. *Lespedeza*

TRIBE 9. PHASEOLEAE

KEY TO SUBTRIBES OCCURRING IN FIJI

Leaflets and calyx eglandular; bracteoles usually present.

Style generally terete and unbearded (sometimes with a few hairs below stigma), sometimes bearded or flattened in subtribe 9d but then petals less complex than in subtribe 9e; stigma terminal and capitate or obsolete; hilum rarely (as in some species of *Erythrina*) covered with tissue.

Flowers not resupinate, or if so then differing in other respects from those of subtribe 9d; leaves trifoliolate.

Petals unequal in length; flowers often adapted to bird- or bat-pollination, the fertile parts loosely housed or exerted; inflorescences pseudoracemose or paniculate, with showy flowers; our species trees, lianas, or climbing herbs. 9a. ERYTHRININAE

Petals subequal in length; flowers mostly adapted to bee-pollination.

Inflorescences often prominently nodose, occasionally paniculate or axillary and few-flowered; seeds diverse, the hilum short to long. 9b. DIOCLEINAE

Inflorescences not or scarcely nodose (sometimes branched in *Pueraria*); seeds smooth, granular, or shagreened, the hilum short. 9c. GLYCNINAE

Flowers generally resupinate; calyx glabrous within; style narrowed or expanded to a glabrous, penicillate, or bearded (in our genera) distal portion; petals often pilose; leaves 1-9-foliolate, with minute uncinata hairs. 9d. CLITORIINAE

Style complicated by expansion, flattening, coiling, or specialized hairs, or if rarely both unbearded and terete then petals elaborate with appendages on standard and with keel petals adaxially joined; stigma terminal or lateral; hilum usually covered with spongy tissue; leaves in all our species trifoliolate. 9e. PHASEOLINAE

Leaflets and (usually) calyx with yellowish, resinous gland dots and with bulbous-based hairs; bracteoles lacking; style slender proximally, distally stiffened and somewhat thickened and glabrous, not bearded; stigma terminal, capitate; inflorescences not nodose. 9f. CAJANINAE

SUBTRIBE 9a. ERYTHRININAE

Standard the longest petal (or subequal to keel petals); anthers uniform; ovary stipitate; stinging hairs absent.

- Petals red, or the wings and keel petals greenish or yellowish but usually red-tinged, the standard lacking appendages, the keel petals much shorter than standard; ovules (2-) numerous; fruits usually linear-oblong, constricted or sinuate between seeds, not winged, the seeds 1-14, the hilum elliptic or oblong; trees (our species), the trunk and branches often aculeate, the pseudoracemes often pyramidal and many-flowered; our species indigenous, cultivated, or naturalized. 26. *Erythrina*
- Petals orange to pinkish red or blue-green, the standard with 2 appendages above claw, the keel petals subequal to standard in length; ovules 1-several; fruits usually inflated, ovoid-oblong to subglobose, the valves often reticulate-nerved, the seeds 1-few, the hilum extending to 1/2 the circumference of seed or more; lianas with pendulous racemes or panicles composed of racemes; indigenous or cultivated. 27. *Strongylocodon*
- Standard shorter than wings or keel petals, with inflexed auricles, the keel petals equal to or longer than wings, stiffened at apex; petals scarlet to pale green, yellowish, or dark purple; 5 larger anthers subbasifixed, alternating with 5 shorter, versatile or dorsifixed ones; ovary sessile, the ovules few; fruits sometimes with wings bordering the sutures, the valves thick, sometimes transversely lamellate or longitudinally ridged; seeds (1-) 2-7 in our species, either subglobose to oblong and with a short hilum and a conspicuous rim-aril, or discoid and with an elongate hilum and without a rim-aril; lianas or climbing herbs; stinging hairs present (at least on young fruits, except in some cultivars); indigenous, cultivated, or naturalized. 28. *Mucuna*
- SUBTRIBE 9b. DIOCLEINAE
- Stigma subglobose, lateral on inner surface of broadened tip of the distally subinvolute and pilose style; vexillary filament free from filament tube of the other stamens; fruits of our species less than 2 cm. broad, the valves without an additional longitudinal rib, the hilum small; climbing herbs with tuberous roots; our species cultivated for its edible tubers and young pods. 29. *Pachyrhizus*
- Stigma small, terminal, the style glabrous at least distally, incurved but not subinvolute.
- Calyx lobes connate into 2 lips, the upper lip large, subentire or 2-lobed, the lower lip trifid; filaments all connate into a tube, the vexillary filament free only near base or rarely entirely free; fruits of our species more than 2 cm. broad, the valves with an additional longitudinal rib near sutural rib, the hilum about half as long as seed or longer; lianas, slender vines, or herbs; our species indigenous or cultivated. 31. *Canavalia*
- Calyx lobes not connate into 2 lips, the upper ones separate or connate but not much larger than the 3 lower ones.
- Vexillary filament free proximally but united in middle with filament tube of the other stamens; flowers large, the petals usually more than 1 cm. in length; fruits large, in our species probably at least 3 cm. broad and with seeds probably larger than 25 × 20 × 10 mm., the hilum (in our species) elongate, encircling more than 3/4 the testa; our species indigenous high-climbing lianas.
- Calyx tube less than twice as long as lobes, the 2 uppermost lobes partially connate; standard not exceeding 3 cm. in length; stamens all fertile or the alternate ones smaller and sterile; fruits with a short stipe, the dorsal suture dilated or winged. 29. *Dioclea*
- Calyx tube 2-4 times longer than lobes, the 2 uppermost lobes adnate in bud but soon becoming completely separate; standard (2.5-) 3-7.5 cm. long; stamens all fertile; fruits stipitate, the stipe about 2 cm. long, the dorsal suture thickened but not dilated nor winged. 30. *Macropsyechanthus*
- Vexillary filament free from filament tube of the other stamens; flowers small, the petals not much exceeding 1 cm. in length; fruits small, of our species about 5 mm. broad and with seeds not much larger than 3.5 × 3 × 2 mm., the hilum small; climbing or trailing herbs; our species cultivated but apparently not naturalized, the stems, leaves, calyces, and fruits copiously pilose with spreading, ferruginous hairs. 33. *Calopogonium*
- SUBTRIBE 9c. GLYCININAE
- Fertile anthers 10, uniform; fruits lacking an apical hook; style obvious, long or short but not obscured by ovary-indument; standard inconspicuously auriculate.
- Flower solitary at inflorescence nodes; upper calyx teeth only partially connate; keel petals much shorter than wings; leaflet blades entire, in our species seldom exceeding 10 × 6 cm.; indigenous or cultivated. 35. *Glycine*
- Flowers 3 or more per inflorescence node.
- Upper calyx teeth partially connate into a bidentate or emarginate lip (and then stipules not produced below point of insertion) or completely united (and then stipules produced both above and below point of insertion); keel petals subequal to wings in length; leaflet blades entire or sinuate-lobed, in our species often 12 × 11 cm. or larger; introduced species, copiously or rarely naturalized. 34. *Pueraria*
- Upper calyx teeth completely united; stipules not produced below point of insertion; keel petals much shorter than wings; leaflet blades entire, not exceeding 7 × 5 cm.; introduced and perhaps naturalized. 36. *Neonotonia*

Fertile anthers 5, the alternate ones small and sterile or lacking; fruits with a sharply bent apical hook formed by the accrescent base of the short, thick style, this in flower sometimes obscured by tufted hairs; flowers paired or fasciculate on rachis or in leaf axils; standard not auriculate; keel petals shorter than wings; leaflet blades entire, in our species not exceeding 7×3.5 cm.; introduced and naturalized.

37. *Teramnus*

SUBTRIBE 9d. CLITORIINAE

Standard short-spurred (or rarely tuberculate) dorsally; calyx campanulate, the 2 upper lobes united into a bifid or emarginate lip (calyx in our species about 10 mm. long); fruits with 4 prominent ribs or wings near sutures (in our species ribbed and not more than 7 mm. broad); leaves in our species 3-foliolate; introduced and naturalized. 38. *Centrosema*

Standard not appendaged; calyx infundibular, the 2 upper lobes connate only at base (calyx in our species about 20 mm. long, with conspicuous lobes); fruits sometimes longitudinally ribbed (but in our species thick-margined and without ribs, about 10 mm. broad); leaves in our species 5- or 7(or 9)-foliolate; introduced and naturalized. 39. *Clitoria*

SUBTRIBE 9e. PHASEOLINAE

Fruits conspicuously 4-winged; ovary winged; inflorescences with fasciculate or solitary flowers at rachis nodes, the bracteoles conspicuous; petals blue to purplish, yellow-, red-, or white-tinged; stipules produced below point of attachment; standard appendages small or none; style terete, flattened toward apex; cultivated only. 40. *Psophocarpus*

Fruits not longitudinally 4-winged; ovary not winged.

Style either uniformly thick or uniformly thin, but not distinctly divided into a tenuous basal part and a thickened upper part, the stigma terminal.

Inflorescences pseudoracemose, long-pedunculate, the flowers clustered at nodes along rachis; standard with 2 callisities on inner surface; style incrassated, conspicuously laterally flattened, straight and blade-like throughout its length, forming an angle of just less than 90° with the ovary and with a line of hairs near top of inner margin, the stigma glabrous; fruits with spongy septa, in our subspecies up to 10×4 cm., the seeds with a linear hilum and a whitish rim-aril, up to 15 mm. long; cultivated and naturalized. 41. *Lablab*

Inflorescences fasciculate and axillary or racemiform at stem apices; standard with 2 linear, lamelliform appendages on inner surface; style subfiliform, glabrous or short-pilose but not barbate, the stigma usually surrounded by a conspicuous ring of hairs; fruits not septate, in our species 3-8 cm. long and 6-8 mm. broad, the seeds with a short hilum and an inconspicuous rim-aril, not more than 6 mm. long; cultivated only. 42. *Macrotyloma*

Style divided into a tenuous basal part and a thick, incrassated upper part.

Stipules not or distinctly produced below point of attachment; floral bracts caducous; style with thickened part rarely curved through more than 180° , introrsely bearded toward apex; stigma introrse or subintrorse (rarely subterminal); keel petals about as long as wings or longer, sometimes with a conical pocket, rarely spiralled in as many as 3 complete turns; uncinatae hairs lacking.

Thickened part of style not abruptly but usually gently curved; petals yellow, blue, or purple; wings slightly shorter than standard; keel petals sometimes with a conical pocket; fruits linear to oblong-linear, subterete or flattened, in our species 3-7 (-14) mm. broad and with 2-15 seeds; stipules produced below point of attachment or not; indigenous, cultivated, and naturalized.

43. *Vigna*

Thickened part of style characteristically abruptly curved through about 90° just above its junction with tenuous part and narrowed and slightly curved toward apex, resembling a squarish hook; petals usually crimson or dark blackish purple; wings suborbicular, large, longer than standard and keel; keel petals without a pocket but with a transverse fold; fruits cylindrical or compressed, narrow, in our species 3-4.5 mm. broad and with 12-30 seeds; stipules not produced below point of attachment; cultivated and naturalized. 44. *Macroptilium*

Stipules not produced below point of attachment; bracts and bracteoles persistent at least to anthesis; style with thickened part curved through at least 360° , glabrous or introrsely pilose distally; stigma oblique, subterminal, or terminal; keel without a pocket, often narrow and elongated, the apex beaked and spiralled in 1-5 complete turns; uncinatae hairs present; cultivated and (one species only) naturalized. 45. *Phaseolus*

SUBTRIBE 9f. CAJANINAE

Ovules 2-8 or more; fruits 2-many-seeded, the valves with transverse or oblique grooves or lines separating seeds, the seeds with an obvious (well-developed although sometimes small) rim-aril.

Erect shrubs or subshrubs; fruits scarcely septate within; seeds with a small rim-aril; cultivated and naturalized. 46. *Cajanus*

Plants twining, trailing (as in our species), or shrubby; fruits distinctly septate; seeds with a well-developed rim-aril; introduced and naturalized. 47. *Atylosia*

Ovules (1 or) 2; fruits 1- or 2-seeded, not septate, the valves without transverse or oblique grooves or lines, the seeds with the rim-aril obsolete (at least in our species).

Leaves in our species digitately trifoliolate; inflorescence bracts sometimes conspicuous (in our species concealing flower buds but deciduous at anthesis); our species a shrub, cultivated only.

48. *Flemingia*

Leaves in our species pinnately trifoliolate; inflorescence bracts inconspicuous, not concealing flowers; our species a climbing or prostrate herb, adventive. 49. *Rhynchosia*

TRIBE 10. AESCHYNOMENEAE

Stipules not adnate to petiole; leaflets in our species numerous (9 or more); flowers pedicellate, the calyx tube broader than long; filaments connate into a sheath split on one or both sides, the vexillary filament sometimes free; anthers uniform; ovary stipitate or substipitate, the ovules often numerous; fruits articulate.

Fruit articles longitudinally ribbed; our species an indigenous shrub or small tree, the leaflets 9-20, usually 2-3 × 0.7-2 cm., the fruit articles 15-24 × 5-8 mm. 50. *Ormocarpum*

Fruit articles reticulate-veined; our species an adventive annual or perennial herb, the leaflets usually 20-60 and 0.2-1.3 × 0.1-0.3 cm., the fruit articles 3-5 mm. long and broad. 51. *Aeschynomene*

Stipules proximally adnate to petiole; leaflets in our species 3 or 4; flowers sessile or subsessile, the calyx tube filiform, much longer than broad; filaments connate into a closed tube, this sometimes at length split on vexillary side; anthers alternately long (and subbasifixed) and short (and versatile); ovary sessile or nearly so, the ovules seldom more than 4.

Leaves in our species trifoliolate, the leaflets seldom exceeding 3 × 1 cm.; distal part of style caducous after anthesis, the lower part persistent, recurved or revolute, forming an inflexed or hooked beak on mature fruit; fruits not developing underground, articulate, the articles 1 or 2 (but usually 1 article aborted); cultivated and sometimes sparingly naturalized. 52. *Stylosanthes*

Leaves in our species 4-foliolate, the leaflets up to 7 × 3 cm.; gynophore elongating after anthesis, becoming reflexed and rigidly acute at apex, in our species at length 1-20 cm. long; fruits maturing underground, subtorulose but not articulate, continuous within, with 1-3 (-6) seeds; cultivated only.

53. *Arachis*

TRIBE 11. VICIEAE

Style not longitudinally folded; filaments not dilated distally.

Style terete or compressed dorsally or laterally, pilose all around or ventrally or abaxially tufted at apex; filament tube oblique at mouth; fruits in our species 10-30 × 2-4 cm., with 1-6 seeds 1-2.5 cm. long, the pericarp with a spongy white layer within; leaflet blades with conduplicate venation (but this in our species sometimes supervolute); leaflets in our species 2-6, 5-10 × 1-5 cm.; cultivated only, for its large, edible seeds. 54. *Vicia*

Style dorsally compressed, pubescent only on adaxial face.

Leaves in our species unijugate, the leaflet blades with supervolute venation, usually 2-4 cm. long; filament tube usually truncate at apex; ovules few-numerous; fruits in our species 5 cm. or more long, the seeds subglobose; cultivated only, for its attractive, fragrant flowers. 55. *Lathyrus*

Leaves in our species with 4-7 pairs of leaflets, the blades with conduplicate venation, usually 1-1.5 cm. long; filament tube oblique at apex; ovules 2; fruits in our species to 1.5 cm. long, the seeds compressed, lenticular; cultivated only, for its small, edible seeds. 56. *Lens*

Style dorsally compressed, adaxially pubescent, longitudinally folded with the margins joined abaxially below stigma; filaments slightly dilated distally, the tube truncate at mouth; fruits in our taxon inflated, with 2-10 subglobose seeds; stipules in our species large, foliaceous, usually larger than leaflets; leaflet blades with conduplicate venation, in our species up to 7 × 4 cm.; cultivated only, for its edible, usually green seeds. 57. *Pisum*

TRIBE 12. CICEREAE

One genus only. 58. *Cicer*

TRIBE 13. TRIFOLIEAE

Petals not persisting in fruit; filaments not dilated; fruits with (1-) many or numerous seeds, not included in calyx; leaves pinnately 3-foliolate.

Fruits straight or rarely falcate, usually many-seeded and dehiscent; flowers without an explosive tripping mechanism, those of our species 1 or 2 in leaf axils; our species cultivated only. 59. *Trigonella*

Fruits usually coiled, sometimes merely falcate, scarcely dehiscent, sometimes spiny (but not in our species); flowers with an explosive tripping mechanism, those of our species numerous in congested racemes; our species cultivated and possibly becoming established. 60. *Medicago*

Petals often persisting in fruit; filaments (at least some) dilated below anthers; fruits 1- or 2(-4)-seeded, often indehiscent and included in calyx; leaves usually digitately 3(-7)-foliolate; several species introduced into Fiji but infrequently becoming established. 61. *Trifolium*

TRIBE 14. CROTALARIEAE

Style distally bearded; anthers 5 + 5 (5 distinctly the longer); keel usually prominently beaked, the beak sometimes twisted; calyx lobes free or the upper and lateral lobes united; fruits usually markedly inflated; leaves simple, 1-foliolate, or 3-7-foliolate; our species either adventive or cultivated (and sometimes naturalized), with leaf or leaflet blades seldom less than 1 cm. broad (and then only in species with simple or 5-foliolate leaves). 62. *Crotalaria*

Style distally glabrous; anthers 4 + 6 (4 distinctly the longer); keel petals rounded at apex; calyx with the 4 upper lobes usually connate in pairs; fruits compressed or only slightly inflated; our species cultivated and becoming naturalized, with 3-foliolate leaves, the leaflet blades narrow, usually 0.5-1 cm. broad. 63. *Lotononis*

1. *MYROXYLON* L. f. Suppl. Pl. 34, 233. 1782; Hutchinson, Gen. Fl. Pl. 1: 332. 1964; Rudd in *Rhodora* 70: 502. 1968, in Rev. Handb. Fl. Ceylon 1: 420. 1980. Nom. cons.

Trees, the stipules minute or lacking; leaves alternate, imparipinnate, estipellate, the leaflets 5-15, alternate, the blades entire, with pellucid dots and streaks; inflorescences axillary and racemose or terminal and paniculate, the flowers small; calyx campanulate-tubular, without basal bracteoles, with 5 short, subequal lobes valvate in bud; petals 5, the standard broadly orbicular, long-clawed, the 4 lower petals subequal, narrow, short-clawed; disk lining base of calyx tube; stamens 10, the filaments free or shortly connate at base, the anthers conspicuous, nearly as long as filaments; ovary long-stipitate, the ovules 2, near apex, the style short, subulate, the stigma terminal, small; fruit stipitate, indehiscent, flattened and narrowed at base, swollen and usually 1-seeded at apex, 2-winged, the seed subreniform.

TYPE SPECIES: *Myroxylon peruiferum* L. f.

DISTRIBUTION: Mexico, Central America, and South America, with two or three species, sometimes cultivated elsewhere, as in Fiji.

USEFUL TREATMENT OF GENUS: HARMS, H. Zur Nomenclatur des Perubalsambaumes. Notizbl. Bot. Gart. Berlin 5: 85-98. 1908.

1. *Myroxylon balsamum* (L.) Harms var. **pereirae** (Royle) Harms in Notizbl. Bot. Gart. Berlin 5: 95. 1908; J. W. Parham, Pl. Fiji Isl. 75. 1964, ed. 2. 115. 1972; Rudd in *Rhodora* 70: 503. 1968, in Rev. Handb. Fl. Ceylon 1: 432. 1980.

Myrospermum pereirae Royle, Man. Mat. Med. ed. 2. 414. 1853.

A tree to 20 m. or more high where indigenous, infrequently cultivated near sea level. The racemes are 5-30 cm. long and bear flowers with white petals and filaments.

TYPIIFICATION: The type of *Myrospermum pereirae* was collected by Jonathan Pereira in El Salvador.

DISTRIBUTION: Southern Mexico to Panama (and possibly Colombia), cultivated elsewhere. Variety *balsamum* (said to be originally from Tolú, near Cartagena, Colombia) is found in Panama, Colombia, and Venezuela; from it var. *pereirae* differs in having its leaflets slightly smaller and its fruits also smaller, 6-8 cm. long, sometimes strongly curved and with the winged lower portion narrowed basally. The resin of the two varieties is said to differ physically and chemically. Both *Myroxylon toluiferum* (= *M. balsamum* var. *balsamum*) and *M. peruiferum* were listed in J. B. Thurston's 1886 *Catalogue* and presumably were first introduced into Fiji by him, but no available vouchers from his gardens permit verification of his names.

LOCAL NAME AND USES: *Balsam of Peru*, a name widely used for both *Myroxylon balsamum* (which more accurately might be known as *balsam of Tolú*) and *M. peruiferum* L. f. (Colombia to Peru, Bolivia, and southern Brazil). Cultivated as a garden ornamental. The resin is the source of balsam used medicinally and as a fixative in perfumery, and the hard, durable wood is valued for cabinet work.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Experiment Station, Nasinu, DA 1552.

2. *CASTANOSPERMUM* Cunn. ex Hook. in Bot. Misc. 1: 241. 1830; Hutchinson, Gen. Fl. Pl. 1: 326. 1964; Verdcourt, Man. New Guinea Leg. 283. 1979; Rudd in Rev. Handb. Fl. Ceylon 1: 436. 1980.

Large tree, estipulate; leaves imparipinnate, estipellate, the leaflets opposite or alternate, coriaceous; inflorescences short-racemose, terminal or borne along branches, the bracts minute, the bracteoles lacking, the flowers large; calyx campanulate, thick-coriaceous, with 5 short, broad lobes; petals fleshy, the standard obovate-orbicular, recurved, the 4 lower petals shorter and narrower than standard; stamens 10, free, the anthers linear, versatile; ovary long-stipitate, the ovules 6 or 7, the style long, the stigma terminal, small; fruit stipitate, oblong, turgid, woody, 2-valved, spongy within between seeds, the seeds few, large, subglobose.

TYPE SPECIES: *Castanospermum australe* Cunn. & Fraser ex Hook.

DISTRIBUTION: Northeastern Australia, New Caledonia, and the New Hebrides, with a single species.

1. *Castanospermum australe* Cunn. & Fraser ex Hook. in Bot. Misc. 1: 241. *t.* 51, 52. 1830; Guillaumin in J. Arnold Arb. 12: 247. 1931; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 113. 1939; P. S. Green in Bramwell, Plants and Islands, 48. 1979; Verdcourt, Man. New Guinea Leg. 283. *fig.* 61. 1979; Rudd in Rev. Handb. Fl. Ceylon 1: 437. 1980; Henty in Papua New Guinea Dept. Forests Bull. 12: 80. *fig.* 49. 1980.

A tree up to 40 m. high and with a trunk to 1.2 m. in diameter where indigenous, reported as sparingly cultivated near sea level. The leaflets are 7-19, elliptic-oblong, acuminate, and up to 16 × 5.5 cm. The racemes, up to 25 cm. long, bear flowers with the calyx yellow, the petals yellow and becoming orange-red, the standard being about 3 cm. long. The fruits are dark brown, up to 25 cm. long and 6 cm. in diameter, with 2-5 dark brown seeds up to 4 cm. long.

TYPIFICATION: The type is *Cunningham & Fraser* (K HOLOTYPE), from the Brisbane River, Queensland, Australia.

DISTRIBUTION: As of the genus, cultivated elsewhere, in the Pacific at least in Java, New Guinea, and Hawaii.

LOCAL NAMES AND USES: *Moreton Bay chestnut*, *Australian chestnut*. This ornamental tree bears seeds that are edible after roasting and can be made into a coarse flour; the wood is also considered useful.

No vouchers support the Fijian record, but Parham (1939, cited above) states that it was introduced in 1923 and in 1939 was growing on the property of W. L. Wallace, Tovu Island, Ra Province, Viti Levu. It should grow well in Fiji but it may not have persisted.

3. *ORMOSIA* Jackson in Trans. Linn. Soc. 10: 360. 1811; Hutchinson, Gen. Fl. Pl. 1: 323. 1964; Rudd in Contr. U. S. Nat. Herb. 32: 287. 1965; Verdcourt, Man. New Guinea Leg. 287. 1979. Nom. cons.

Trees, the stipules caducous; leaves imparipinnate (rarely unifoliolate), estipellate, the leaflets 3-19, opposite or subopposite and with coriaceous blades; inflorescences terminal or axillary, paniculate or racemose, the bracts and bracteoles small; calyx-tube campanulate, the lobes subequal or the upper 2 subconnate; petals 5, the standard suborbicular, the wings oblique, obovate-oblong, the keel petals free, more incurved than wings, often overlapping dorsally; stamens 10, free, alternately slightly unequal, the anthers dorsifixed, versatile; ovary subsessile, the ovules 2 or more, the style filiform, recurved, the stigma lateral and introrse, less often terminal; fruit oblong to orbicular, compressed or inflated around seeds, woody or coriaceous, dehiscent (rarely

indehiscent), sometimes septate between seeds, the seeds 1-6, ellipsoid to subglobose, red, yellow, or black, unicolored or bicolored.

TYPE SPECIES: *Ormosia coccinea* (Aubl.) Jackson (*Robinia coccinea* Aubl.). Typ. cons.

DISTRIBUTION: India and southern China through Malesia to northern Australia, and in the New World from southern Mexico to southern Brazil, with about 100 species.

USEFUL TREATMENT OF GENUS: RUDD, V. E. The American species of *Ormosia* (Leguminosae). Contr. U. S. Nat. Herb. 32: 279-384. 1965.

1. *Ormosia monosperma* (Sw.) Urb. Symb. Antill. 1: 321. 1899; Rudd in Contr. U. S. Nat. Herb. 32: 355. pl. 1-4. 1965; J. W. Parham, Pl. Fiji Isl. ed. 2. 115. 1972.

Sophora monosperma Sw. Nov. Gen. & Sp. Prodr. 66. 1788.

Ormosia dasycarpa Jackson in Trans. Linn. Soc. 10: 362. t. 26, nom. illeg. 1811; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 91. 1948.

A tree to 17 m. high where indigenous, occasionally cultivated in Fiji near sea level. The leaflets, usually 7-11, are up to 20 × 6 cm., and the petals are dark purple, the standard with a white spot. The fruits are densely velutinous, up to 6 × 3.5 × 2 cm. and with 1-3 seeds, these red and black and up to 17 × 17 × 11 mm. Fruits have been noted in Fiji in January.

TIPIFICATION: The type was collected in the West Indies by Alexander Anderson (BM HOLOTYPE; putative ISOTYPE at G from St. Vincent). The type of *Ormosia dasycarpa*, illegitimate because Jackson cited *Sophora monosperma* as a synonym, was presumably also collected by Anderson (G HOLOTYPE) (Rudd, 1965).

DISTRIBUTION: Lesser Antilles to Trinidad and northeastern Venezuela, cultivated elsewhere, in the Pacific at least in Java and Hawaii.

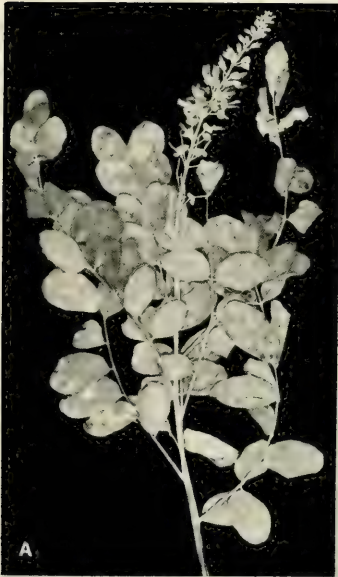
LOCAL NAME AND USE: Commonly known as *bead tree*; the seeds are often made into necklaces, although this has not been noted in Fiji, where the species is grown as an ornamental.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Experiment Station, Nasinu, DA 1564; Reform School grounds, Nasinu, DA 7298. The species was recorded (Parham, 1948) as growing in the Suva Botanical Gardens, but no voucher is available.

4. *SOPHORA* L. Sp. Pl. 373. 1753; Seem. Fl. Vit. 65. 1865; Hutchinson, Gen. Fl. Pl. 1: 328. 1964; Rudd in *Rhodora* 70: 521. 1968; Polhill in Fl. Trop. E. Afr. Leg. Papil. 43. 1971; Verdcourt, Man. New Guinea Leg. 289. 1979; Rudd in Rev. Handb. Fl. Ceylon 1: 439. 1980.

Trees or shrubs, rarely perennial herbs, the stipules deltoid or lacking; leaves alternate, imparipinnate, 8-64-foliolate, the stipels setaceous or often absent; inflorescences terminal or axillary, racemose or paniculate, few-many-flowered, the bracts small to sometimes large, the bracteoles small, more often apparently absent, the pedicels solitary, swollen or jointed proximally; calyx tube campanulate to tubular, the lobes small to prominent, subequal or the upper 2 often fused; petals 5, the standard obovate to orbicular, usually short-clawed, the wings obliquely oblong, the keel petals overlapping or dorsally connate; stamens 10, free or the filaments connate at base, alternately subequal, the anthers dorsifixed, versatile; ovary short-stipitate, the ovules several-numerous, the style incurved, filiform-subulate, short, the stigma minute,

FIGURE 30. *Sophora tomentosa*; A, distal portion of branchlet, with foliage and an inflorescence, × 1/4; B, flower, with one wing petal removed, × 4; C, distal portion of branchlet, with foliage and an infructescence, × 1/4; D, portion of disintegrating fruit and seeds, one turned to show hilum, × 2. A & B from DA 16850, C from Smith 1096, D from Valentine 34.



terminal; fruit moniliform, strongly constricted between seeds, terete or slightly compressed, sometimes winged, fleshy to coriaceous, indehiscent or tardily dehiscent, the seeds 1-6 (-15), ellipsoid to globose, usually with a small hilum.

LECTOTYPE SPECIES: *Sophora tomentosa* L. (vide Rudd in *Rhodora* 70: 522. 1968; Yakovlev in *Taxon* 21: 716. 1972), one of Linnaeus's six original species. This lectotypification (originally suggested by Hitchcock and Green in 1929) must replace the ING choice of *S. alopecuroides* L. (designated by Britton and Brown in 1913) because all five species of Linnaeus except *S. tomentosa* have now been referred to other validly published genera (cf. ICBN, Guide for the determination of types, 4e).

DISTRIBUTION: Most warmer parts of the world, and sometimes in temperate areas, with 50-75 species, one of which is indigenous in Fiji. If *Sophora* is divided into genera or sections (cf. Polhill in *Adv. Leg. Syst.* 229. 1981), sect. *Sophora* will include seven-ten widely distributed, seaborne species.

1. *Sophora tomentosa* L. Sp. Pl. 373. 1753; A. Gray, *Bot. U. S. Expl. Exped.* 1: 460. 1854; Seem. in *Bonplandia* 9: 255. 1861, in op. cit. 10: 296. 1862, Viti, 435. 1862, Fl. Vit. 66. 1865; Drake, *Ill. Fl. Ins. Mar. Pac.* 157. 1890; Guillaumin in *J. Arnold Arb.* 12: 246. 1931; Christophersen in *Bishop Mus. Bull.* 128: 100. 1935; Yuncker in op. cit. 220: 137. 1959; J. W. Parham, *Pl. Fiji Isl.* 77. 1964, ed. 2. 118. 1972; Rudd in *Rhodora* 70: 526. 1968; St. John & A. C. Sm. in *Pacific Sci.* 25: 328. 1971; Polhill in *Fl. Trop. E. Afr. Leg. Papil.* 44. 1971; B. E. V. Parham in *New Zealand Dept. Sci. Indust. Res. Inform. Ser.* 85: 34. 1972; Verdcourt, *Man. New Guinea Leg.* 289. fig. 64. 1979; Henty in *Papua New Guinea Dept. Forests Bull.* 12: 94. fig. 55. 1980; Rudd in *Rev. Handb. Fl. Ceylon* 1: 439. 1980. FIGURE 30.

A shrub or tree 1-14 (usually 2-5) m. high, often abundant in coastal thickets or forest near sea level. The flowers have pale or bright yellow petals, the filaments and style being greenish yellow; the fruits turn from pale green to grayish brown. Flowers and fruits are to be seen during most of the year.

LECTOTYPIFICATION: Four references were listed by Linnaeus; Polhill (1971, cited above) indicates *Hermann* 1: 61 & 3: 13 (BM), from Ceylon, as syntypes.

DISTRIBUTION: *Sophora tomentosa* as a whole occurs on both coasts of Africa and northward to China and eastward into the Pacific, and also in America from Mexico and the West Indies to eastern South America. It has been divided into several subspecies, our material falling into subsp. *tomentosa*, which is widespread on tropical and subtropical coasts from eastern Africa and Madagascar northward to China and eastward to eastern Australia and into Polynesia at least to the Society and Austral Islands. About 40 Fijian collections are at hand, but the species is to be expected along most shores in the archipelago.

LOCAL NAMES AND USES: *Kau ni yalewa* is frequently applied to this species (as to other, quite different plants); more questionable names are *kau ni yalewa tevoro* (Serua), *nandrana* (Nandronga & Navosa), and *manawi ni sawana* (Kambara). In addition to providing a useful windbreak behind beaches, the *Sophora* is said to have medicinal uses; the leaves are mixed with coconut oil and used as a compress.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Lautoka, *Greenwood* 309. NANDRONGA & NAVOSA: Vicinity of Singatoka, *Valentine* 34. SERUA: Navutulevu, *DA L.13450 (DF 1212)*; near mouth of Taunovo River, *DA 13851 (DF 347)*. NAITASIRE: Vunindilo, *DA*, May 5, 1951. TAILEVU: Near Queen Victoria School, Matavatathou, *DA 15369*. VITI LEVU without further locality, *Seemann* 130. MBENGGGA: Raviravi, *DA 6076*. KANDAVU: Namalata isthmus region, *Smith* 179. OVALAU: Vicinity of Thawathi, *Smith* 8095. WAKAYA: *Tothill* 121a. KORO: East coast, *Smith* 1096. NAIRAI: *Tothill* 121. VANUA LEVU:

THAKAUNDOVE: Wairuku Plantation, near Nathavanandi, DA 16850; Maravu, near Salt Lake, Degener & Ordonez 14228. TOTOYA: DA 13243. WAILANGILALA: Bryan 592. KAMBARA: On limestone formation, Smith 1260. FIJI without further locality, U. S. Expl. Exped., Stork 886.

5. *DIPTERYX* Schreber, Gen. Pl. 485. 1791; Hutchinson, Gen. Fl. Pl. I: 392. 1964. Nom. cons.

Trees; leaves paripinnate, estipellate, the leaflets 3-14, opposite or alternate, the blades sometimes glandular-punctate, with the costa excentric; inflorescences terminal, paniculate, the bracts small, the bracteoles small or lacking; calyx colored and glandular-punctate, the tube (hypanthium) short, the upper 2 lobes enlarged, separate to base, petaloid, the lower 3 lobes reduced to small teeth; petals 5, the standard emarginate, the wings free, emarginate, the keel petals apiculate; stamens 10, the filaments connate into a sheath split above, the anthers uniform, versatile; ovary stipitate, the ovule 1, subapical, the style straight or incurved, the stigma small, minutely papillose; fruit drupaceous, ovoid, indehiscent, the seed pendulous, cylindrical-fusiform.

TYPE SPECIES: *Dipteryx odorata* (Aubl.) Willd. (*Coumarouna odorata* Aubl.). Typ. cons.

DISTRIBUTION: Tropical America, with about ten species, one of which has been cultivated in Fiji.

1. *Dipteryx odorata* (Aubl.) Willd. Sp. Pl. 3: 910. 1802; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 90. 1948.

Coumarouna odorata Aubl. Hist. Pl. Guiane Fr. 2: 740, t. 296. 1775.

A tree up to 40 m. high where indigenous, sparingly cultivated near sea level. The leaf rachis is conspicuously winged and the leaflets are usually 3-6, up to 15 × 8 cm. The bracteoles are pink and fugacious, the calyx rose-pink with the upper 2 lobes 10-12 mm. long, and the petals also rose-pink. The fruits, yellow-brown and up to 10 × 6 cm. when mature, each bear a single seed up to 5 × 2 cm. and black or brownish.

TYPIFICATION: The species is based on an Aublet collection from Guiana.

DISTRIBUTION: South America, from Colombia to Brazil; introduced on a commercial scale into Trinidad and other West Indian islands, and frequently cultivated elsewhere. The species was apparently introduced into Fiji by J. B. Thurston, who listed it in his 1886 *Catalogue*. Parham (1948, cited above) indicates that a specimen was growing in the Suva Botanical Gardens at that time, but no voucher seems available.

LOCAL NAME AND USES: The name in widespread use is *tonka bean*. The cured seeds have a characteristic odor and flavor due to coumarin, and are used for flavoring and scenting tobacco, and also in perfumery or to flavor confectionery, liqueurs, soap, etc. For the most part wild plants supply the market, but commercial cultivation has been successful in Trinidad and other West Indian islands. The timber is hard and durable. Its introduction into Fiji was presumably for experimental purposes or as an ornamental tree. Interesting accounts of the species are provided by Burkill (Dict. Econ. Prod. Malay Penins. ed. 2. 859. 1966) and Pursglove (Trop. Crops, Dicot. 258-263. fig. 40. 1968).

6. *ANDIRA* Juss. Gen. Pl. 363. 1789; Hutchinson, Gen. Fl. Pl. I: 391. 1964; Polhill in Fl. Trop. E. Afr. Leg. Papil. 62. 1971. Nom. cons.

Trees, the stipules various; leaves alternate, imparipinnate (rarely trifoliolate), with setaceous stipels or none, the leaflets opposite or rarely alternate; inflorescences

terminal or sometimes axillary, paniculate, the flowers often crowded and subsessile, the bracts and bracteoles small and caducous; calyx tube short-campanulate, subtruncate or with short teeth, the upper ones united nearly to apex; petals much longer than calyx, the standard suborbicular, without appendages or auricles, the wings free from keel, the keel petals overlapping beneath; stamens 10, the filament of the vexillary stamen free or rarely connate with the others, the anthers dorsifixed, versatile, uniform; ovary usually stipitate, oblong-ellipsoid, the ovules (1-) 2-4, the style short, incurved, the stigma small, terminal, penicillate; fruit drupaceous, indehiscent, woody, ovoid or obovoid, the seed solitary, pendulous, ellipsoid to ovoid, the hilum small.

TYPE SPECIES: *Andira racemosa* Lam. ex St.-Hil.

DISTRIBUTION: About 20 species in tropical America, one of them extending to Africa. One species is cultivated in Fiji.

1. *Andira inermis* (Wright) DC. Prodr. 2: 475. 1825; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 90. 1948, Pl. Fiji Isl. 70. 1964, ed. 2. 109. 1972; Polhill in Fl. Trop. E. Afr. Leg. Papil. 63. 1971; Mattos in Acta Amazonica 9: 261. 1979.

Geoffroea inermis Wright in London Med. J. 8: 256. 1787.

Geoffraea inermis Sw. Fl. Ind. Occ. 1255. 1806.

A spreading tree 7-15 m. high, with a trunk to 30 cm. in diameter, sparingly cultivated near sea level. The leaves are 20-40 cm. long, with 4-8 pairs of leaflets usually not exceeding 11 × 5 cm. The calyx and petals are pink to purple-red and the filaments are white. The fruits are round in cross section, up to 7 cm. long, with a single ellipsoid seed about 2.5 cm. long. Some of our collections were flowering in October.

TYPIFICATION: The author of the basionym is often indicated to be Swartz (1806), who referred to Wright's "*Goeffraea inermis jamaicensis*" (in Philos. Trans. 67: 512. t. 10. 1777) and indicated the locality as "Jamaicae occidentalis." Probably no specimen was preserved, but perhaps Wright's 1777 illustration may be considered the type. The combination is often shown as "(Sw.) H. B. K.," but (Nova Gen. et Sp. 6: 385. 1824) Kunth merely listed *Geoffraea inermis* Sw. there without making a new combination.

DISTRIBUTION: Continental tropical America and the West Indies, also extending to Africa (western Africa to Sudan). Two endemic subspecies occur in Africa, where the American subsp. *inermis* probably occurs naturally in forests around the Gulf of Guinea (Polhill, 1971, cited above). Mattos (1979, cited above) divided the American population into two varieties. The infraspecific identity of our cultivated plant cannot be certain.

LOCAL NAME AND USES: This ornamental tree is often known as *bastard mahogany*; its wood is considered useful for furniture, cabinet work, etc. Parham (1972, cited above) thinks that it was probably introduced into Fiji about 1937.

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Suva Botanical Gardens, *MacDaniels 1127*, *DA 2540*, *5592*, *5661*, *11958*; Suva, in private garden, *DA 3808*; Nasese, *DA 11700*.

7. *DALBERGIA* L. f. Suppl. Pl. 52, 316. 1782; Seem. Fl. Vit. 64. 1865; Hutchinson, Gen. Fl. Pl. 1: 389. 1964; Polhill in Fl. Trop. E. Afr. Leg. Papil. 95. 1971; Verdcourt, Man. New Guinea Leg. 291. 1979. Nom. cons.

Trees or shrubs, sometimes scandent, or lianas, sometimes spiny, the stipules small, usually caducous; leaves alternate, imparipinnate (rarely unifoliolate), estipellate, the leaflets mostly alternate; inflorescences terminal and axillary, paniculate or less often racemose, the bracts small, subsistent, the bracteoles usually minute, the flowers small; calyx campanulate, 5-lobed, rarely with the lateral lobes reduced, the upper 2 lobes broader than the others, the lowest lobe usually narrower and the longest; petals 5, the standard usually emarginate, the wings free, oblong, the keel petals connate on lower side toward apex; stamens 9 or 10, the filaments all connate into a sheath open



FIGURE 31. *Dalbergia candenatensis*, from *Smith 6621*; A, portion of branchlet with foliage and inflorescences, $\times 1/2$; B, old flower with developing ovary, the petals and anthers fallen, $\times 4$; C, young flower spread open, with a bracteole at apex of pedicel, $\times 20$.

above or the vexillary filament free or absent or the filament sheath divided into 2 phalanges or irregularly, the anthers small, ovate to obovate, with short, subtransverse slits; ovary stipitate, the ovules 1-few, the style incurved, short, the stigma small, terminal; fruit samaroid, indehiscent, oblong or linear, reticulately veined, sometimes thickened over the median seed chambers, the seeds 1 or rarely few, reniform or oblong.

TYPE SPECIES: *Dalbergia lanceolaria* L. f.

DISTRIBUTION: Pantropical and subtropical, with about 100 species. One indigenous species is found in Fiji. Additionally, *Dalbergia lanceolaria* L. f. is probably represented by *DA 1543*, a sterile specimen from a plant once grown at the Experiment Station, Nasinu, Naitasiri Province, Viti Levu, but never established. *Dalbergia sissoo* DC. was listed as introduced in J. B. Thurston's 1886 *Catalogue*, but it seems not to have persisted.

1. *Dalbergia candenatensis* (Dennst.) Prain in *J. Asiat. Soc. Bengal* **70** (2): 49. 1901; Merr. Enum. Philipp. Fl. Pl. **2**: 294. 1923; Yuncker in *Bishop Mus. Bull.* **220**: 142. 1959; Verdcourt, *Man. New Guinea Leg.* 295, fig. 65, A-C. 1979. FIGURE 31.

Cassia candenatensis Dennst. *Schlus. Hort. Malabar.* **12**, 32. 1818.

Dalbergia monosperma Dalz. in *Hook. J. Bot. Kew Gard. Misc.* **2**: 36. 1850; Seem. in *Bonplandia* **9**: 255. 1861; Viti, 435. 1862; Fl. Vit. **64**. 1865; Drake, *Ill. Fl. Ins. Mar. Pac.* **156**. 1890; Guillaumin in *J. Arnold Arb.* **12**: 246. 1931; J. W. Parham, *Pl. Fiji Isl.* **73**. 1964, ed. 2. 110. 1972.

Dalbergia torta Graham in Wall. Num. List no. 5873, nom. nud. 1832; A. Gray, Bot. U. S. Expl. Exped. 1: 458, nom. nud. 1854; Seem. Viti, 435, nom. nud. 1862; Graham ex Prain in J. Asiat. Soc. Bengal 66(2): 120. 1897.

A scrambling liana or sprawling shrub, strictly littoral in thickets along beaches and river banks and on the inner edges of mangrove swamps. The leaves have 3-7 leaflets usually 1.5-4 × 1-2.5 cm. and rounded or emarginate at apex. The flower buds are yellowish green and the mature flowers, not more than 1 cm. long, have white petals; the curved-oblong fruits are no larger than 3.5 × 1.5 cm. The species, not abundant in Fiji, has been noted in flower in November and February, in fruit only in February insofar as collections are dated.

TYPEFICTION AND NOMENCLATURE: *Cassia candenatensis* is based on Rheede, Hort. Ind. Malabar. 6: pl. 25; *Dalbergia monosperma*, according to Dalzell, "crescit in collibus provinciae Malwan;" and *D. torta* is probably best lectotypified by Wallich 5873 among the several specimens cited by Prain in 1897. The three taxa are now uniformly considered synonymous.

DISTRIBUTION: India to southern China and eastward throughout Malesia to Australia and Tonga.

LOCAL NAMES AND USE: *Ndenimana* or *wa ndenimana*; medicinal uses have been recorded in Fiji, the bark being part of an internal remedy for sore throat, the root part of an internal remedy for illness after childbirth.

AVAILABLE COLLECTIONS: VITI LEVU: NAMOSE: Wainandoi River near mouth, Mead 1969. REWA: Vicinity of Lami, H. B. R. Parham 37, Gillespie 4615. VITI LEVU and TAVEUNI: (TAILEVU: Namara; "Vuna"), Seemann 128. MBENGGGA: Savusavukalou, Weiner 197. VANUA LEVU: MATHUATA: Banks of lower Lambasa River, Smith 6621; vicinity of Lambasa, Greenwood 554 (Oct. 24, 1922); Mathuata coast, Greenwood 554 (Jan. 2, 1924). THAKAUNDROVE: Nathavanandi, Weiner 71-7-47. FIJI without further locality, U. S. Expl. Exped.

8. PTEROCARPUS Jacq. Select. Stirp. Amer. 283. 1763; Hutchinson, Gen. Fl. Pl. 1: 388.

1964; Polhill in Fl. Trop. E. Afr. Leg. Papil. 81. 1971; Rojo in Phanerogam.

Monogr. 5: 11. 1972; Verdcourt, Man. New Guinea Leg. 298. 1979. Nom. cons.

Trees, the stipules small or rarely foliaceous; leaves alternate, imparipinnate (very rarely unifoliate), estipellate, the leaflets alternate to subopposite, the blades often minutely glandular beneath; inflorescences axillary or terminal, racemose or paniculate, the bracts and bracteoles small, caducous; calyx turbinate to campanulate, shortly 5-lobed, the upper 2 lobes connate; petals 5, clawed, the standard usually suborbicular and with a well-developed claw, the wings obliquely obovate to spatulate, the keel petals usually shorter than wings, connate on lower side; stamens 10 (-11), the filaments all connate into a sheath split above and sometimes below, the vexillary filament sometimes free, the anthers dorsifixed, versatile, longitudinally dehiscent; ovary sessile or stipitate, the ovules 2-8, the style filiform, slightly incurved, the stigma small, terminal; fruit compressed, indehiscent, suborbicular to asymmetrical, narrowly to broadly winged, the wing curved laterally or right around to base, the seed-bearing part central, variously thickened or hardened, the seeds 1-3 (-4), reniform or oblong-reniform.

TYPE SPECIES: *Pterocarpus officinalis* Jacq. Typ. cons.

DISTRIBUTION: Pantropical (eastward in the Pacific to the New Hebrides), with about 20 species, most numerous in Africa. One species is cultivated in Fiji.

USEFUL TREATMENT OF GENUS: ROJO, J. P. Pterocarpus (Leguminosae-Papilionaceae) revised for the world. Phanerogam. Monogr. 5: 1-119. 1972.

1. *Pterocarpus indicus* Willd. Sp. Pl. 3: 904. 1803; Merr. Interpret. Rumph. Herb. Amb. 270. 1917; J. W. Parham, Pl. Fiji Isl. 76. 1964, ed. 2. 116. 1972; Rojo in Phanerogam. Monogr. 5: 41. fig. 7. 1972; Verdcourt, Man. New Guinea Leg. 298. fig. 66. 1979.

A tree up to 48 m. high where indigenous, occasionally cultivated near sea level. The leaves have 5-11 leaflets usually up to 10 × 5 cm., ovate to lanceolate. The fragrant flowers, about 1 cm. long, have yellow or orange-yellow petals, and the suborbicular fruits, up to 6 cm. in diameter with a stiffly membranaceous wing, are brown in drying. Fruits were obtained in Fiji in March and April.

TIPIFYKATION: The entire basis of *Pterocarpus indicus* is *Lingoum rubrum* Rumph. Herb. Amb. 2: 205. t. 70. 1741. Of the two forms recognized by Rojo (1972, cited above), our material falls into f. *indicus*, lacking bristles on the seed-bearing part of the fruit.

DISTRIBUTION: Southeastern Asia (north to Ryukyu Islands) through Malesia and into the Pacific to the Caroline Islands and the New Hebrides, cultivated elsewhere.

LOCAL NAME AND USES: In Fijian cultivation the usual name is *padouk*, which more often is applied to *Pterocarpus dalbergioides* and perhaps other species of the genus. Usually cultivated as an ornamental, *P. indicus* is an important timber tree where indigenous, with durable wood used for furniture, boat building, and small items. Interesting details are provided by Burkill (Dict. Econ. Prod. Malay Penins. ed. 2. 1861-1864. 1966).

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Kalambo, DA 16432; Experiment Station, Nasinu, DA 1553, 5513. REWA: Suva, in private gardens, DA 16773, L.26244. Although the last number was collected in the "Thurston Botanical Garden" (presumably that of the second Sir Maynard Hedstrom), the species was probably introduced later than 1886, since Thurston did not then list it in his *Catalogue*.

9. INOCARPUS J. R. & G. Forst. Char. Gen. Pl. 33. 1775, ed. 2. 65. 1776; Seem. Fl. Vit. 69. 1865; Hutchinson, Gen. Fl. Pl. 1: 316. 1964; St. John in Naturaliste Canad. 98: 575. 1971; Verdcourt, Man. New Guinea Leg. 301. 1979. Nom. cons.

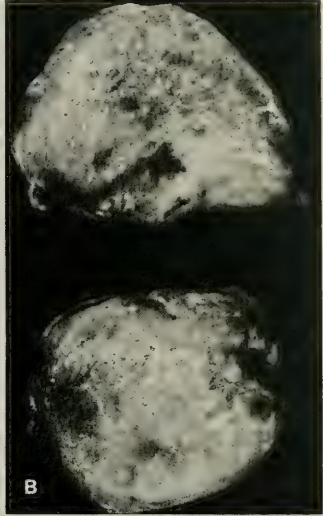
Aniotum Parkinson, J. Voy. Endeavour, 39. 1773.

Trees, the stipules small, caducous; leaves alternate, simple, the petiole very short, the blades large, entire, pinnate-nerved; inflorescences axillary, simple or branched, spicate, the bracts and bracteoles small, caducous, the flowers sessile or subsessile; calyx tubular-campanulate, closed in bud, obtusely bilobed or spathaceous and subregularly 3-5-toothed; corolla with 5 (4-6) petals connate into a tube proximally, the petals equal, linear, imbricate in bud; stamens 8-10, the filaments connate into a tube adnate to base of petals, the anthers short, subsessile at 2 levels on filament tube, didymous, dehiscent lengthwise; ovary subsessile, the ovule 1, the style short, the stigma oblique; fruit ovoid to obovoid, slightly stipitate, compressed, indehiscent, the pericarp fibrous, the seed 1, without endosperm, the cotyledons fleshy.

TYPE SPECIES: *Inocarpus edulis* J. R. & G. Forst. (= *I. fagifer* (Parkinson) Fosberg).

DISTRIBUTION: Malesia and Pacific Islands, probably with three species, one of which is indigenous in Fiji.

Inocarpus seems to be an aberrant representative of the tribe Dalbergieae (Polhill in Adv. Leg. Syst. 235. 1981), having a highly modified corolla with similar, linear lobes (petals), and with the filament tube connate to the corolla, the alternation of filament length being very pronounced. The truly simple leaves (with one pulvinus) do not resemble those of typical legumes.



1. *Inocarpus fagifer* (Parkinson) Fosberg in J. Wash. Acad. Sci. **31**: 95, as *I. fagiferus*. 1941; St. John in Naturaliste Canad. **98**: 575. 1971, in Biol. J. Linn. Soc. **4**: 309. 1972; Verdcourt, Man. New Guinea Leg. **302**, fig. 67. 1979. FIGURE 32.

Aniotum fagiferum Parkinson, J. Voy. Endeavour, 39. 1773; "Parkinson ex Z" in Naturforscher (Halle) **4**: 230. 1774.

Inocarpus edulis J. R. & G. Forst. Char. Gen. Pl. 33, t. 33. 1775, ed. 2. 66, t. 33. 1776; Forst. f. Pl. Esc. Ins. Oc. Austr. 50. 1786, Fl. Ins. Austr. Prodr. 34. 1786; Seem. in Bonplandia **9**: 258. 1861, Viti, 435. 1862, Fl. Vit. 70. 1865, op. cit. 427. 1873; Drake, Ill. Fl. Ins. Mar. Pac. 156. 1890; Guillaumin in J. Arnold Arb. **12**: 246. 1931; Christophersen in Bishop Mus. Bull. **128**: 102. 1935; B. E. V. Parham in Agr. J. Dept. Agr. Fiji **13**: 44. 1942; J. W. Parham in op. cit. **19**: 90. 1948; Merr. in Chron. Bot. **14**: 347. 1954; Yuncker in Bishop Mus. Bull. **220**: 143. 1959; J. W. Parham in Agr. J. Dept. Agr. Fiji **29**: 32. 1959; St. John & A. C. Sm. in Pacific Sci. **25**: 328. 1971.

Amotum fagiferum Solander ex Seem. Fl. Vit. 70, pro syn. 1865.

Inocarpus fagiferus Fosberg ex Yuncker in Bishop Mus. Bull. **178**: 63. 1943; J. W. Parham, Pl. Fiji Isl. 64. fig. 28. A. 1964, ed. 2. 99. fig. 29. A. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 156. 1970; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 43. 1972.

A tree to 30 m. high, sometimes locally abundant in coastal forest and on the edges of mangrove swamps, and often slightly inland up to an elevation of 400 m. in dry, open, or dense forest; also often cultivated. The massive trunk of mature trees is buttressed and irregularly fluted; the bole may be long and the crown spreading. The leaf blades are oblong, up to 40 × 18 cm. The fragrant flowers have the calyx white or pinkish, the corolla, filaments, and ovary white to pale yellow. The fruit is yellow-green, becoming darker, and up to 10 × 8 × 4.5 cm., the seed often measuring 8 × 7 × 3 cm. Flowers are noted in practically all months, and fruits seem best developed between April and October.

TYPIFICATION AND NOMENCLATURE: Parkinson's brief description (1773) may be taken as the type; it serves as a fairly inadequate descriptio generico-specifica. His description was doubtless drawn up from Banks and Solander material collected in Tahiti; at BM there are three specimens identified as *Aniotum fagiferum*, one indicated as "Capt. Cook" and two as "Sir J. Banks and Dr. Solander." As lectotype of *Inocarpus edulis* I take the BM specimen marked "G. Forster's Herbarium. 102. 197. *Inocarpus edulis*;" 197 is the number assigned by Forster on p. 34 of his *Prodromus*, where the locality is indicated as "Societatis, Amicorum et nouarum Hebridum Insulae." Merrill's opinion (1954, cited above) to the contrary, most botanists are now willing to consider Parkinson's description as valid, unmistakably referring to the *Tahitian chestnut*.

DISTRIBUTION: Malesia into the Pacific at least as far as the Marquesas, Society, and Austral Islands. Sykes (1970, cited above) believes that it was an aboriginal introduction into Niue and perhaps elsewhere. It is indeed so valuable a tree that it would surely have been carried eastward by early voyagers, but the fruits are probably bat-carried and perhaps seaborne as well, and one cannot be sure that its wide distribution in the southern Pacific is due to human activity. More than 40 Fijian collections are at hand.

LOCAL NAMES AND USES: The usual names are *ivi* and *Tahitian chestnut*; sometimes *ivi ndamu* and *ivi sere* are used. The *ivi* is one of the most common and most valued trees in Fijian coastal forests. The edible seeds are usually cooked by roasting the whole fruit or by boiling the separated seed; thus prepared, the seeds have a delicious, chestnutlike flavor, or they can be made into puddings or *mandrai* (bread). In earlier

FIGURE 32. *Inocarpus fagifer*: A, distal portion of branchlet, with foliage and inflorescences, × 1/4; B, fruits, × 1/2; C, lower part of corolla and filament tube spread open, showing anthers at 2 levels and gynoeceum, × 15; D, distal portion of inflorescence, × 4. A from *Smith 1175*, B from *Bryan 513*, C & D from *DA 4033*.

times the *ivi* seeds were particularly valued in periods of breadfruit scarcity. The wood was used for small articles such as tool handles and is now considered suitable for interior finishing. The leaves and bark are reputed to have medicinal properties and are parts of remedies for "relapses" and "pain in bones."

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Lautoka, *Greenwood 428*. NANDRONGA & NAVOSA: Mbemana, Ruwailevu Tikina, *H. B. R. Parham 138*. SERUA: Flat coastal strip in vicinity of Ngaloa, *Smith 9686*. NAMOSI: Wainandoi River, *DA 8364*. RA: Rakiraki, *DA 4034*. NAITASIRI: Vicinity of Vinundawa (cult.?), *DA 10060*. TAILEVU: Between Mburetu and Ndaku, *DA 888*. REWA: Lami, *DA 4033*; Suva Botanical Gardens (cult.), *DA 15457*. KANDAVU: Western end of island, near Cape Washington, *Smith 306*. OVALAU: *Milne 253*; valley of Mbureta and Lovoni Rivers, *Smith 7733*. VANUA LEVU: MATHUATA: Mt. Uluimbau, south of Lambasa, *Smith 6601*. THAKAUNDOVE: Ndromoninuku, *DA 16823*. KANATHEA: *Graeffe s. n.* VANUA MBALAVU: Narothisi Village, *Garnock-Jones 1109*. LAKEMBA: *Harvey s. n.*; near Nukunuku Village, *Garnock-Jones 802*. KAMBARA: *Bryan 513*. FULANGA: On limestone formation, *Smith 1175*. FIJI without further locality, *Seemann 371*, *Home s. n.*

10. *ABRUS* Adanson, *Fam. Pl.* 2: 327, 511. 1763; *Seem. Fl. Vit.* 63. 1865; Hutchinson, *Gen. Fl. Pl.* 1: 451. 1964; Verdcourt in *Fl. Trop. E. Afr. Leg. Papil.* 113. 1971; *Man. New Guinea Leg.* 305. 1979; Rudd in *Rev. Handb. Fl. Ceylon* 1: 445. 1980.

Subshrubs or lianas, the stipules small, usually persistent; leaves paripinnate, with minute, filiform stipels, the leaflets numerous, opposite, the rachis projecting beyond the terminal pair; inflorescences axillary or terminal, pseudoracemose, the bracts and bracteoles short, the flowers small, often second-fasciculate on short, reduced branchlets, rarely sessile in leaf axils; calyx tube subtruncate or short-denticulate, the upper 2 teeth subconnate; petals 5, the standard ovate to orbicular, short-clawed, the wings long-clawed, the keel petals shallowly falcate, abaxially adnate; stamens 9 (vexillary stamen absent), the filaments connate into a sheath split distally and shortly adnate to petals at base, the anthers uniform or 4 slightly smaller; ovary subsessile, the ovules numerous, the style short, incurved, the stigma capitate; fruit oblong or linear, subtergoid or compressed, elastically dehiscent, subseptate between seeds, the seeds subglobose or ellipsoid, shining, the hilum small.

TYPE SPECIES: *Abrus precatorius* L. (*Glycine abrus* L.).

DISTRIBUTION: Pantropical, with about 17 species, one of which is indigenous in Fiji.

USEFUL TREATMENT OF GENUS: VERDCOURT, B. A reappraisal of the species of the genus *Abrus* Adans. *Kew Bull.* 24: 235-253. 1970.

1. *Abrus precatorius* L. *Syst. Nat. ed. 12.* 2: 472. 1767; A. Gray, *Bot. U. S. Expl. Exped.* 1: 436. 1854; *Seem. in Bonplandia* 9: 255. 1861, Viti, 435. 1862, *Fl. Vit.* 63. 1865; Drake, *Ill. Fl. Ins. Mar. Pac.* 150. 1890; Guillaumin in *J. Arnold Arb.* 12: 245. 1931; Christophersen in *Bishop Mus. Bull.* 128: 103. 1935; Yuncker in *op. cit.* 178: 63. 1943, in *op. cit.* 220: 144. 1959; J. W. Parham, *Pl. Fiji Isl.* 70. 1964, ed. 2. 108. 1972; Sykes in *New Zealand Dept. Sci. Indust. Res. Bull.* 200: 144. 1970; Verdcourt in *Kew Bull.* 24: 240. 1970, in *Fl. Trop. E. Afr. Leg. Papil.* 114. 1971; B. E. V. Parham in *New Zealand Dept. Sci. Indust. Res. Inform. Ser.* 85: 21, 38, 79. 1972; Verdcourt, *Man. New Guinea Leg.* 305. *fig. 68*. 1979; Henty in *Papua New Guinea Dept. Forests Bull.* 12: 79. *fig. 47*. 1980; Rudd in *Rev. Handb. Fl. Ceylon* 1: 446. 1980. FIGURE 33.

Glycine abrus L. *Sp. Pl.* 753. 1753.

A scrambling vine or scandent shrub, often frequent along beaches and rocky shores, sometimes on limestone, and slightly inland to an elevation of about 80 m. on edges of forest. The leaves have 16-40 oblong to ovate leaflets up to 30 × 10 mm., and the petals are pink to lavender or white. Mature fruits are somewhat swollen, oblong, up to 5 cm. long and 1.5 cm. broad, with (1-) 3-7 seeds, these up to 7 × 5 mm. and red or

scarlet with a black area around the hilum, or very rarely entirely black or whitish. Flowers are inconspicuous and there are no dated Fijian collections; fruits have been observed between June and February.

LECTOTYPIFICATION: The lectotype, lacking fruits, is *Hermann*, vol. 2, p. 6 (BM), from Ceylon. Verdcourt (1970, cited above) indicated this as the holotype, but Linnaeus mentioned other prior references for *Glycine abrus*.

DISTRIBUTION: Tropical Africa and Madagascar to tropical Asia, eastward to Australia and in the Pacific to the Tuamotus, now widely naturalized in America. Our material falls into subsp. *preparatorius*, with a range from tropical Asia into the Pacific. The African and Indian Ocean material, with tuberculate pods, falls into subsp. *africanus* Verdcourt. About 20 collections from Fiji have been examined.

LOCAL NAMES AND USES: Names used in Fiji are *tele*, *lere ndamu*, *ndiri ndamu*, and *nggiri ndamu*. As in many other areas, the seeds are used as beads, but they are poisonous to cattle and humans unless boiled. A decoction of leaves is used in many countries as medicinal for coughs, sore throat, etc., and in the Yasawas is reported as used for gonorrhoea. An interesting account of the species is provided by Burkill, *Dict. Econ. Prod. Malay Penins.* ed. 2, 4-9, 1966.

REPRESENTATIVE COLLECTIONS: YASAWAS: SAWA-I-LAU (south of Yasawa I.), *DA 13663*. WAYA: Yalombi, *St. John 18030*. VITI LEVU: Mba: Vatia Point, *DA 13573*. NANDRONGA & NAVOSA: Thuvu, west



FIGURE 33. *Abrus precatorius*: A, portion of a stem, with foliage and fruits, $\times 1/3$; B, dehiscent fruit and bicolored seeds, $\times 2$. A from *Smith 1034*, B from *St. John 18030*.

of Singatoka, *Greenwood 242*. KORO: East coast, *Smith 1034*. NGAU: Shore of Herald Bay, near Sawaieke, *Smith 7929*. VANUA LEVU: MATHUATA: *Seemann 110*, p. p.; Nakuthi Island, off mouth of Ndreketi River, *DA 15288*; Undu Point, *Tothill 117c*. THAKAUNDROVE: Savusavu, *DA 5754*. TAVEUNI: *Seemann 110*, p. p. NAVUTU-I-LOMA: *Bryan 386*, p. p. FULANGA: On limestone formation, *Smith 1176*. ONGEA NDIRIKI: *Bryan 386*, p. p. FIJI without further locality, *U. S. Expl. Exped.*

11. DERRIS Lour. Fl. Cochinch. 432. 1790; Seem. Fl. Vit. 64. 1865; Hutchinson, Gen. Fl. Pl. 1: 384. 1964; Polhill in Fl. Trop. E. Afr. Leg. Papil. 73. 1971; Verdcourt, Man. New Guinea Leg. 314. 1979. Nom. cons.

Climbing or scrambling shrubs or lianas, less often trees or erect shrubs, the stipules usually small, caducous; leaves alternate, imparipinnate (sometimes 3-foliolate), with small stipels or estipellate, the leaflets opposite; inflorescences terminal and axillary, pseudoracemose or pseudopaniculate, the bracts and bracteoles small, caducous, the flowers crowded on short ultimate branches or fasciculate at nodes; calyx usually cupuliform, truncate or with short teeth (the upper two united); petals much longer than calyx, purple, pink, or white, the standard obovate or orbicular, without distinct basal appendages, the wings usually with a fold or pocket on basal part of blade, slightly adherent to keel, the keel petals slightly curved and somewhat united on lower side distally; stamens 10, the filaments connate in a closed tube, the vexillary filament free at base but connate with the others above middle, the anthers dorsifixed, versatile; ovary sessile or short-stipitate, the ovules 2-few, the style filiform, incurved, the stigma small, terminal; fruit orbicular or elliptic to linear-oblong, flat, membranous to thin-coriaceous, indehiscent, narrowly winged along upper suture or both sutures, the seeds 1-few, flat, reniform to orbicular.

TYPE SPECIES: *Derris trifoliata* Lour. Typ. cons.

DISTRIBUTION: Pantropical, most numerous in southeastern Asia, with more than 50 species. In Fiji five species are known to occur, one of them indigenous. An interesting discussion of some of the rotenone-producing species of *Derris* is provided by Burkill, Dict. Econ. Prod. Malay Penins. ed. 2. 795-804. 1966.

KEY TO SPECIES

- Tree; leaflets 19-43, the blades 1.5-3.2 × 0.8-1.3 cm., rounded to emarginate at apex; petals purplish to pinkish; cultivated only. 1. *D. microphylla*
- Lianas or scrambling shrubs; leaflets rarely more than 13, the blades larger; petals pink to white.
- Leaflets (7-) 11 or 13 (-19), the blades 2-8.5 × 1-3 cm., obtuse to emarginate at apex; pseudoracemes pendulous, 15-45 cm. long, the calyx purple; fruits oblong to linear, 3.5-8 × 0.9-1.3 cm., with a wing about 1.5 mm. broad; cultivated as an ornamental vine. 2. *D. scandens*
- Leaflets 3-13 (-15), the blades broader (infrequently less than 3 cm. broad), acuminate or cuspidate at apex, the calyx pale green to pink; fruits broader, seldom less than 2 cm. broad, with a wing or wings 1-5 mm. broad; rotenone-yielding plants often used as fish poisons.
- Leaves 3-7-foliolate, the leaflet blades ovate to elliptic, 5-12 (-15) × (1.5-) 2-6 (-7.5) cm., acuminate to cuspidate at apex (acumen rounded or emarginate at tip), the secondary nerves prominent beneath; fruits winged only on upper suture; indigenous species, often common in littoral habitats. 3. *D. trifoliata*
- Leaves 5-13 (-15)-foliolate, the leaflet blades oblong to elliptic or oblong-obovate, 6-15 (-23) × 2.5-7 (-10) cm., the secondary nerves prominent or strongly elevated beneath; fruits winged on both sutures; cultivated and sometimes naturalized.
- Petiole, rachis, and petiolules usually strigillose with ferruginous hairs; leaflets (5-) 9-13 (-15), the petiolules of the proximal leaflets deflexed, the leaflet blades oblong to oblanceolate, 6-15 (-16) × 2.5-5 (-7) cm. (sometimes up to 42 × 8 cm. elsewhere) (lowermost pair sometimes only 2.5 × 1.3 cm.); paler beneath than above, sparsely strigillose above (hairs up to 1 mm. long), usually obviously strigillose beneath (hairs 0.3-0.5 mm. long), abruptly or gradually acuminate at apex (acumen rounded at tip, 2-3 mm. broad toward tip); inflorescences 10-26 cm. long; standard silky-strigose dorsally. 4. *D. elliptica*
- Petiole, rachis, and petiolules glabrous or sparsely strigillose; leaflets 5 or 7 (or 9), the petiolules of the proximal pair of leaflets not or rarely deflexed, the leaflet blades elliptic (or terminal one elliptic-obovate), 10-15 (-23) × 5-7 (-10) cm. (said to be as small as 5.3 × 2 cm. elsewhere), concolorous or only slightly paler beneath than above, glabrous or sparsely strigillose beneath on nerves and veinlets (hairs 0.2-0.3 mm. long), usually gradually caudate-acuminate at apex

(acumen obtuse to rounded at tip, 1-1.5 (-2) mm. broad toward tip); inflorescences 10-16 cm. long; standard glabrous. 5. *D. malaccensis*

1. ***Derris microphylla*** (Miq.) B. D. Jackson, *Index Kew.* 1: 332. 1893; Valetton ex Backer, *Voorl. Schoolfl. Java*, 95. 1908.

Brachypterium microphyllum Miq. *Fl. Ned. Ind. Suppl.* 296. 1861.

Derris dalbergioides Baker in Hook. f. *Fl. Brit. Ind.* 2: 241. 1878; J. W. Parham in *Agr. J. Dept. Agr. Fiji* 19: 90. 1948, *Pl. Fiji Isl.* 73. 1964.

A sparingly cultivated tree with a densely pseudopaniculate inflorescence up to about 13 cm. long. The flowers have the calyx dark purple and the petals dark red-violet to pinkish. The elliptic, narrowly winged fruit attains a size of about 7 × 2 cm.

TYPIFICATION AND NOMENCLATURE: The type of *Brachypterium microphyllum* was collected by Teijsmann in Palembang Province, Sumatra; for *Derris dalbergioides* Baker cited collections by Parish, Helfer, and Maingay, indicating the distribution as Java, his material presumably being cultivated. The two names are now considered to refer to the same concept.

DISTRIBUTION: Although the distribution is sometimes indicated as southern Burma to Java, *Derris microphylla* is probably indigenous only in Sumatra and is cultivated in the adjacent areas (Backer & Bakh. f. *Fl. Java* 1: 618. 1963).

LOCAL NAME AND USE: No name was recorded for this ornamental tree in Fiji, but elsewhere in cultivation it is sometimes called *vetch tree*.

No voucher supports the record, but Parham (cited above) indicates that the species was in cultivation in 1948 in the Suva Botanical Gardens. It is deciduous for a brief period and then bears masses of flowers, which do not last long.

2. ***Derris scandens*** (Roxb.) Benth. in *J. Proc. Linn. Soc. Bot.* 4: Suppl. 103. 1860.

Dalbergia scandens Roxb. *Pl. Coromandel* 2: 49. t. 192. 1805.

A vine cultivated near sea level (a robust liana where indigenous), the flowers with the calyx purple and the petals pink to white. In Fiji flowers have been noted in January, fruits in May.

TYPIFICATION: No collection was indicated by Roxburgh; if one from the Coromandel area is available it could be taken as the type, or otherwise his illustration would serve.

DISTRIBUTION: India to Malesia and Australia, cultivated elsewhere.

USE: This attractive ornamental vine, for which no local name was recorded, is cultivated as a vine trained over trellises.

AVAILABLE COLLECTION: OVALAU: Levuka, *Greenwood 581* (κ, collected in fruit May 18, 1923); Greenwood noted that he had observed the same plant in flower in January, 1926.

3. ***Derris trifoliata*** Lour. *Fl. Cochinch.* 433. 1790; Christophersen in *Bishop Mus. Bull.*

128: 102. 1935; Yuncker in op. cit. 220: 143. 1959; J. W. Parham, *Pl. Fiji Isl.* 73.

1964, ed. 2. 111. 1972; Mune & J. W. Parham in *Dept. Agr. Fiji Bull.* 48: 22. *fig.* 5.

1967; Polhill in *Fl. Trop. E. Afr. Leg. Papil.* 74. *fig.* 14. 1971; St. John & A. C. Sm.

in *Pacific Sci.* 25: 328. 1971; B. E. V. Parham in *New Zealand Dept. Sci. Indust.*

Res. Inform. Ser. 85: 39. 1972; Verdcourt, *Man. New Guinea Leg.* 326. *fig.* 72.

1979; Henty in *Papua New Guinea Dept. Forests Bull.* 12: 86. *pl.* 29. 1980.

FIGURE 34.

Robinia uliginosa Willd. *Sp. Pl.* 3: 1133. 1802.

Derris uliginosa Benth. in Miq. *Pl. Junghuhn.* 1: 252. 1852; A. Gray, *Bot. U. S. Expl. Exped.* 1: 457. 1854, in *Proc. Amer. Acad. Arts* 5: 317. 1862, in *Bonplandia* 10: 35. 1862; Seem. in op. cit. 10: 296. 1862, *Viti*,

435. 1862, *Fl. Vit.* 65. 1865; Drake, *Ill. Fl. Ins. Mar. Pac.* 156. 1890.

Pongamia piscatoria Seem. in *Bonplandia* 9: 255, nom. nud. 1861.

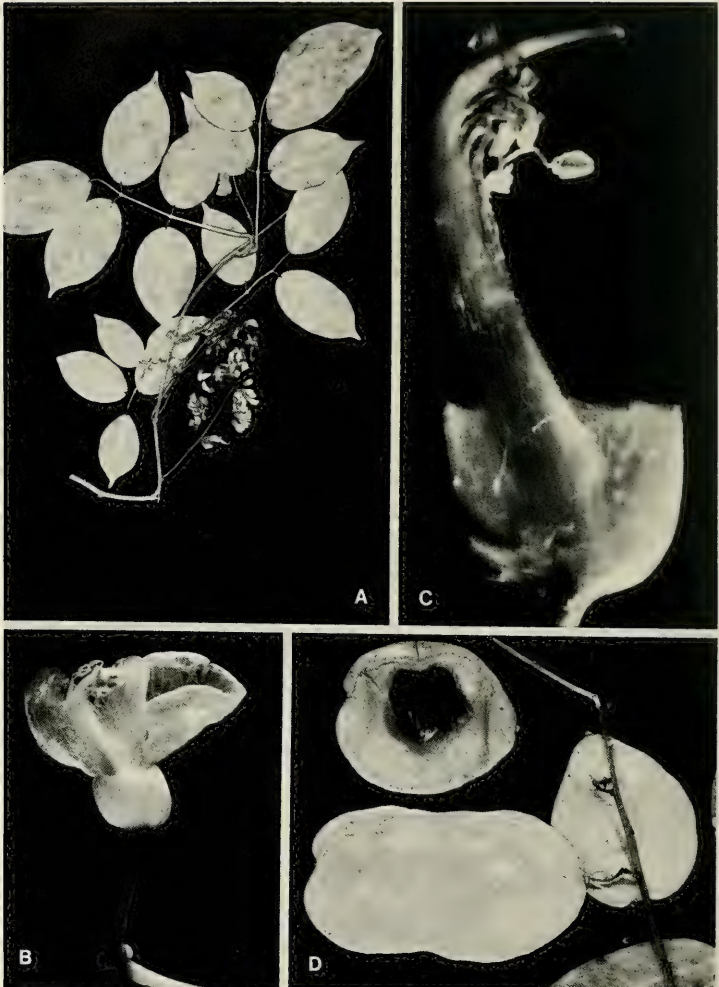


FIGURE 34. *Derris trifoliata*: A, distal portion of branchlet, with foliage and inflorescences, $\times 1/4$; B, flower, with one wing and one keel petal removed, $\times 4$; C, staminal sheath with protruding style and calyx (partially removed), $\times 12$; D, fruits, one with a valve removed to show a seed, $\times 1$. A from *Smith 3*, B & C from *Smith 9335*, D from *MacDaniels 1077*.

A woody vine or scrambling liana, frequent near sea level or at low elevations near the sea in thickets or on edges of forest, sometimes on limestone cliffs and on the edges of mangrove swamps. The calyx is pale green; the petals are pale pink or greenish white and faintly pink-tinged; and the filaments and styles are white. The fruits are subreniform to oblong, in Fiji usually 3–4.5 × 2–3.5 cm., with a wing 1–2 mm. broad along the upper suture, and the 1 or 2 seeds are oblong-reniform, 1.5–2.4 cm. long. Both leaflets and fruits are sometimes larger in other parts of the range. In Fiji the species is noted in flower and fruit throughout the year.

TYPIFICATION AND NOMENCLATURE: The type of *Derris trifoliata* is Loureiro (P HOLOTYPE), from Canton, China; that of *Robinia uliginosa* is Roxburgh (B probable HOLOTYPE), from eastern peninsular India. The two concepts are now universally combined.

DISTRIBUTION: Eastern Africa to tropical Asia, eastward through Malesia to Australia and into the Pacific as far as Tonga and Samoa, sometimes cultivated and naturalized elsewhere. Mune and Parham (1967, cited above) consider *Derris trifoliata* "almost certainly an aboriginal introduction." But there seems no reason to believe it anything but indigenous in the Fijian Region, where it is very abundant in coastal situations, its fruits and seeds probably being readily seaborne. About 40 collections are at hand.

LOCAL NAMES AND USE: Commonly used names are *nduva*, *tuva*, *nduva nganga*, *wa nduva*, *wa tuva*, *nduva ni Viti*, *tuva ni Viti*, and *raurau*. The crushed roots and stems are used as a fish poison. The species was declared a noxious weed in Fiji in 1965, not because of any agricultural hazard but because its use as a fish poison is prohibited by law. In view of its abundance and widespread use in Fiji, the control methods described by Mune and Parham (1967, cited above) would appear futile and perhaps needless, as the species is one of the weakest fish poisons of the rotenone-yielding species of *Derris*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: Mba: Shores of the Mba River near its mouth, *Smith 4738*. NANDRONGA & NAVOSA: Korotongo, *O. & I. Degener 32200*. SERUA: Flat coastal strip in vicinity of Ngaloa, *Smith 9335*. NAMOSI: Wainandoi River near its mouth, *DA 10800*. RA: Penang, *Greenwood 538A*. TAILEVU: Mokani, *DA 630*. REWA: Between Lami and Suva, *MacDaniels 1077*. KANDAVU: Namalata isthmus region, *Smith 3*. YANUTHA (probably one of the Yanutha Islands between Ovalau and Moturiki): *Storck 883*. KORO: East coast, *Smith 1102*. VANUA LEVU: Mba: Nasarowangga, *DA 1100*. MATHUATA: Lambasa, *Greenwood 538*. THAKAUNDROVE: Vicinity of Savusavu, *Bierhorst F50*. TAVEUNI: Somosomo, *Seemann 127* (source of the name *Pongamia piscatorica*). MOALA: *Milne 118*. VANUA MBALAVU: Slopes of Korolevu, near Lomaloma, *Garnock-Jones 1040*. VANUA VATU: *Bryan 555*. LAKEMBA: Near Tambou Jetty, *Garnock-Jones 766*.

4. *Derris elliptica* (Wall.) Benth. in J. Proc. Linn. Soc. Bot. 4: Suppl. 111. 1860; J. W. Parham, Pl. Fiji Isl. 73. 1964, ed. 2. 111. 1972; Mune & J. W. Parham in Dept. Agr. Fiji Bull. 48: 20. fig. 4. 1967; Purselglove, Trop. Crops, Dicot. 256. fig. 39. 1968; Verdcourt, Man. New Guinea Leg. 320. 1979; Henty in Papua New Guinea Dept. Forests Bull. 12: 86. pl. 28. 1980.

Pongamia elliptica Wall. Pl. Asiat. Rar. 3: 20. t. 237. (March) 1832.

Galedupa elliptica Roxb. Hort. Beng. 53, nom. nud. 1814, Fl. Ind. ed. 2. 3: 242. (Oct.–Dec.) 1832.

A liana or scrambling shrub, cultivated from near sea level to an elevation of about 400 m. and also occasionally naturalized along roadsides and on creek banks. The pedicels are purplish and the petals pink; the brownish fruits, usually about 5 × 2 cm., have a wing 1–5 mm. broad along both sutures. Flowers have been collected in Fiji between September and February.

TYPIIFICATION AND NOMENCLATURE: *Pongamia elliptica*, the earlier basionym, was described from a plant cultivated in the Botanic Garden of Calcutta, originally from Amboina. *Galedupa elliptica* was mentioned by Roxburgh merely as a native of "Amboyna and the Malay Islands."

DISTRIBUTION: India into Malesia, but apparently not indigenous in New Guinea as often stated (Verdcourt, 1979, cited above), now introduced into many tropical areas as a fish poison and a potential insecticide and often naturalized.

LOCAL NAMES AND USES: *Nduva*, *nduva ni vavalangi*, and *derris* have been recorded in Fiji. The pounded roots are used as a fish poison, as in the indigenous *Derris trifoliata*. *Derris elliptica* was introduced in 1935 for trial as a potentially commercial rotenone-yielding plant for use in insecticides. However, it could become a weed of pastoral and plantation lands and therefore was declared a noxious weed in 1965. The comments of Mune and Parham (1967, cited above) may in part refer to *D. malaccensis*, the two species not being readily separable.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Mbemana, Ruwailevu Tikina, DA 16029. NAMOSI: Vicinity of Namosi, DA 14579. NAITASIRI: Toninaiwau, Tholo-i-suva, DA 10899 (coll. B. E. V. Parham).

Derris elliptica and *D. malaccensis* have often been confused in herbaria and doubtless in field studies. Ridley (Fl. Malay Penins. 1: 593-599. 1922) discusses their separation, and I am also indebted to W. R. Sykes and P. J. Garnock-Jones for further comments that have been incorporated into my key to species. At least some specimens from Samoa, Niue, and the Cook and Society Islands that have been referred to *D. elliptica* actually represent *D. malaccensis*; it is doubtful whether or not the former species occurs in those archipelagoes. Both species are found in Fiji, but *D. malaccensis* seems the more common, although only *D. elliptica* is known to flower there. I have seen no flowering collections of *D. malaccensis* from Fiji or eastward to the Societies. Therefore the key character referring to the indument of the standard is not very useful. The leaf indument, the number of leaflets, and the shape, apices, and coloration of their blades provide characters that generally serve to distinguish the two species.

5. *Derris malaccensis* (Benth.) Prain in J. Asiat. Soc. Bengal 66: 107. 1897; J. W. Parham, Pl. Fiji Isl. 73. 1964, ed. 2. 111. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 150. 1970; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 38. 1972; Verdcourt, Man. New Guinea Leg. 322. 1979.

Derris cuneifolia var. *malaccensis* Benth. in J. Proc. Linn. Soc. Bot. 4: Suppl. 112. 1860.

Derris elliptica sensu Christophersen in Bishop Mus. Bull. 128: 102. 1935; Yuncker in op. cit. 178: 62. 1943; non Benth.

A liana or scrambling shrub, cultivated and doubtless sometimes naturalized near sea level or slightly inland. Although fertile specimens have not been seen from Fiji, elsewhere the calyx is pink and the petals white to pink; the fruits, up to 7.5 × 2.7 cm., are winged on both sutures with wings about 2 mm. and 4 mm. broad.

TYPIIFICATION: Bentham based his description on material obtained by Griffith in Malacca.

DISTRIBUTION: Southern Burma into Malesia, but presumably not indigenous in New Guinea, and cultivated (and often naturalized) there and elsewhere, in the Pacific as far east as the Society Islands.

LOCAL NAMES AND USES: *Nduva*, *tuva*, and *nduva ni niukini*; like the preceding species it is a fish poison and a potential source of an insecticide. The time of

introduction is not known, but it probably entered Fiji earlier than *Derris elliptica*. In spite of the local name *nduva ni niukini* (and the name *New Guinea creeper* used on Niue and perhaps elsewhere), this species is not considered indigenous in New Guinea (Verdcourt, 1979, cited above).

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Mbulu, near Sovi Bay, *Degener 15038*. NATTASIRE: Central Agricultural Station, Navuso, *DA*, May 23, 1934. VITI LEVU without further locality, *Gillespie 3664.1* (Nov. 4, 1927). LAKEMBA: Near Tumbou Jetty, *Garnock-Jones 769*.

12. *LONCHOCARPUS* H. B. K. *Nova Gen. et Sp.* 6: ed. fol. 300. (April) 1824, ed. qu. 383. (July) 1824; Hutchinson, *Gen. Fl. Pl.* 1: 383. 1964; Polhill in *Fl. Trop. E. Afr. Leg. Pabil.* 65. 1971; Verdcourt, *Man. New Guinea Leg.* 309. 1979. *Nom. cons.*

A genus closely related to *Derris*, but with the stipules sometimes subsistent, the leaves rarely unifoliolate, and the inflorescences sometimes paniculate (i. e. with pedicels inserted singly on axes) as well as pseudopaniculate or pseudoracemose; fruit without obviously winged sutures, the upper suture thin or thickened or rarely very slightly winged (and then the pedicels inserted singly or paired on inflorescence axes).

TYPE SPECIES: *Lonchocarpus sericeus* (Poir.) DC. (*Robinia sericea* Poir.). *Typ. cons.*

DISTRIBUTION: Tropical America, Africa, and Madagascar, mostly American, with about 100 species, one of which is cultivated in Fiji.

1. *Lonchocarpus sericeus* (Poir.) DC. *Prodr.* 2: 260. 1825; J. W. Parham, *Pl. Fiji Isl.* ed. 2. 114. 1972; Verdcourt, *Man. New Guinea Leg.* 309. 1979.

Robinia sericea Poir. in *Lam. Encycl. Méth. Bot.* 6: 226. 1804.

A tree to about 12 m. high, sparingly cultivated near sea level. The 7-13 leaflets have ovate to oblong-elliptic blades 3-14 × 2-9 cm., these copiously sericeous beneath and with conspicuous secondary nerves. The axillary pseudoracemes are up to 20 cm. long, and the very short-pedicellate flowers are paired at the apices of short lateral branchlets. The calyx is copiously sericeous, with small, persistent bracteoles at base, and the petals are pinkish to pale purple, pilose without. Fruits are not available on Fijian specimens, but they are obscurely winged along the upper suture, pale-pilose, 8-13 × 2-2.5 cm., and with 1-several seeds. Our collections were flowering in March.

TYPEFICTION: The type is *Vahl* (P HOLOTYPE in Herb. Jussieu), collected in America. The combination in *Lonchocarpus* is sometimes accredited to H. B. K. in 1824, but it was not then made in the sense of ICBN, Art. 33.1.

DISTRIBUTION: Tropical America, and also said to occur in western Africa, often cultivated elsewhere.

USE: The species is a very attractive ornamental tree, said by Parham (1972, cited above) to have been growing in the Suva Botanical Gardens as early as 1938.

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Suva Botanical Gardens, *DA 1318, 12340, s. n.* (March 16, 1948).

13. *PONGAMIA* Vent. *Jard. Malmaison, pl.* 28. 1803; Seem. *Fl. Vit.* 65. 1865; Hutchinson, *Gen. Fl. Pl.* 1: 383. 1964; Verdcourt, *Man. New Guinea Leg.* 311. 1979. *Nom. cons.*

Tree, the stipules fugacious; leaves alternate, imparipinnate, estipellate, the leaflets opposite; inflorescences axillary, racemose or composed of a few racemes grouped into a panicle, the bracts caducous, the flowers paired (rarely 3) at inflorescence nodes, the pedicels with minute bracteoles above middle; calyx cupuliform, subtruncate or undulate at margin; petals 5, the standard suborbicular to obovate, with inflexed auricles at base, sericeous without, the wings oblong, slightly adherent to keel, the keel

petals obtuse, coherent at apex; stamens 10, the filaments connate into a closed sheath, the vexillary filament free at base but connate to the others above middle, the anthers versatile; ovary subsessile, the ovules 2 (rarely 3), the style filiform, incurved, the stigma small, terminal; fruit obliquely oblong-ellipsoid, somewhat flattened, thick-coriaceous to subligneous, indehiscent or tardily dehiscent, the seeds usually solitary (rarely 2 or 3), thick, ellipsoid-reniform.

TYPE SPECIES: *Pongamia glabra* Vent., nom. illeg. (*Robinia mitis* L., nom. illeg.; *Cytisus pinnatus* L.) = *P. pinnata* (L.) Pierre.

DISTRIBUTION: Mascarene Islands and tropical Asia, throughout Malesia to Australia and eastward to Samoa, with a single species which is indigenous in Fiji.

1. ***Pongamia pinnata*** (L.) Pierre, Fl. For. Cochinch. sub t. 385. 1899; Merr. Interpret. Rumph. Herb. Amb. 271. 1917; Guillaumin in J. Arnold Arb. 12: 246. 1931; J. W. Parham, Pl. Fiji Isl. 76. 1964, ed. 2. 116. fig. 32. 1972; St. John & A. C. Sm. in Pacific Sci. 25: 328. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 44. 1972; Verdcourt, Man. New Guinea Leg. 312. fig. 70. 1979.

FIGURE 35.

Cytisus pinnatus L. Sp. Pl. 741. 1753.

Robinia mitis L. Sp. Pl. ed. 2. 1044, nom. illeg. 1763.

Pongamia glabra Vent. Jard. Malmaison, pl. 28, nom. illeg. 1803; A. Gray, Bot. U. S. Expl. Exped. 1: 455. 1854, Atlas, pl. 53, A. 1856; Seem. in Bonplandia 9: 255. 1861, in op. cit. 10: 296. 1862, Viti, 435. 1862, Fl. Vit. 65. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 156. 1890.

As it occurs in Fiji, *Pongamia pinnata* is an often spreading tree 4–14 m. high (to 25 m. elsewhere), with a trunk to 1 m. in diameter, found at elevations from near sea level to 150 m. but usually near the sea in beach thickets, on rocky shores, along river banks, and sometimes in lowland forest. The leaves, 13–30 cm. long, have (3 or) 5 or 7 leaflets, these with ovate to oblong, acuminate blades 6–16 × 2.5–8 cm. (up to 25 × 15 cm. elsewhere). The petals are white to pinkish without and rich pink or purple within; the fruits turn from greenish to dull brown and are ellipsoid, beaked, 3–6 (–8.5) × 1.5–3 cm., sometimes 1.2 cm. thick at maturity, with seeds usually 2–2.5 cm. long. Flowers and fruits are seen at most seasons.

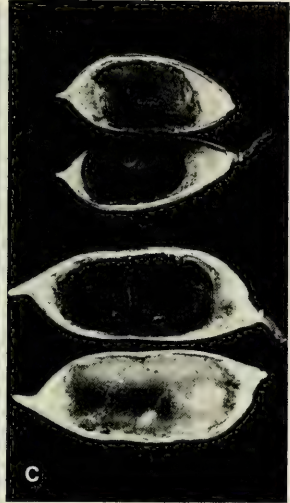
TYPEIFICATION: As *Cytisus pinnatus*, Linnaeus cited only a reference to Plukenet's Phytographia, "104. f. 3," presumably based on a plant from India.

DISTRIBUTION: As of the genus. About 50 Fijian collections have been examined, the species being found near most shores.

LOCAL NAMES AND USES: Widely used Fijian names for this well-known species are *vesi*, *vesivesi*, *vesiwai*, *vesi ni wai*, *vesivesiwai*, *visivisiwai*, and *tosinga*. It is considered a useful timber tree and is also reputed to have medicinal uses, a tea from the leaves being used for relapses and a filtrate from the scraped root drunk for stomach ulcers.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Yalombi, St. John 18089. VITI LEVU: MBA: Shores of Mba River near its mouth, Smith 4732. NANDRONGA & NAVOSA: Thuvu, Greenwood 68. SERUA: Vunaniu, DA L.13451 (DF 1210). RA: Rakiraki, DA 4052. NAITASIRE: Experiment Station, Nasinu, DA 1563. TAILEVU: Matavatathou, DA 15370. REWA: Vicinity of Suva, MacDaniels 1011. MBENGGGA: Seemann 126, p. p.; Raviravi, DA 6077. KANDAVU: Namalata isthmus region, Smith 186. OVALAU: North of Levuka, Gillespie 4498; Lando islets south of Ovalau, Seemann 126, p. p. YANUTHA (probably one of the Yanutha Islands between Ovalau and Moturiki): Storck 884. NGAU: MacGillivray s. n.; shore of Herald Bay, vicinity of Sawaieke, Smith 7905. VANUA LEVU: MATHUATA: U. S. Expl. Exped. (fl.). THAKAUNDROVE: Maravu, near Salt Lake, Degener & Ordóñez 14178. VANUA LEVU without further locality, U. S. Expl. Exped. (fr.). TAVEUNI: Seemann 126, p. p. MOALA: North coast, Smith 1401. NAITAMBA: DA 11815. VANUA VATU: Limestone slope above Taira Village, Bryan 553. ONEATA: Graeffe 1378. FULANGA: On limestone formation, Smith 1229. ONGEA LEVU: Bryan 433. ONGEA NDRIKI: Bryan 388.

FIGURE 35. *Pongamia pinnata*; A, distal portion of branchlet, with foliage and inflorescences, × 1/4; B, flower, the standard at right, the wing and keel petals at left, × 6; C, opened fruits and seeds, × 1; D, infructescences, × 1/2. A from Bryan 553, B from Smith 1229, C from Bryan 433, D from Smith 186.



14. *TEPHROSIA* Pers. Syn. Pl. 2: 328. 1807; Seem. Fl. Vit. 54. 1865; Hutchinson, Gen. Fl. Pl. 1: 396. 1964; J. B. Gillett in Fl. Trop. E. Afr. Leg. Papil. 157. 1971; Verdcourt, Man. New Guinea Leg. 338. 1979. Nom. cons.

Cracca L. Sp. Pl. 752. 1753. Nom. rejic. vs. *Cracca* Benth. (1853).

Herbs or shrubs with soft wood, stipulate; leaves alternate, imparipinnate (rarely simple, unifoliolate, or palmately 3-7-foliolate, but in none of our species), estipellate, the leaflets opposite, entire, with numerous parallel lateral nerves extending to margin and often with a well-developed marginal nerve; inflorescences pseudoracemose, terminal, leaf-opposed, or less often axillary, bracteate, the flowers usually 2 or more together, lacking bracteoles; calyx 5-lobed, the lobes or teeth subequal or the upper 2 subconnate; petals 5, usually yellow to purple, clawed, the standard suborbicular, without basal auricles, pilose without, the wings slightly adherent to keel, the keel petals auriculate at base of blade; stamens 10, the filaments connate into a sheath, the vexillary filament free at base, subconnate with the others above middle, infrequently free; intrastaminal disk usually present; ovary sessile, the ovules usually many (1-22), the style incurved or inflexed, the stigma terminal, often penicillate; fruit linear or oblong, compressed, beaked, usually pilose, dehiscent (often explosively so, the valves then becoming twisted), the seeds longitudinally to transversely arranged.

TYPE SPECIES: *Tephrosia villosa* (L.) Pers. (*Cracca villosa* L.).

DISTRIBUTION: Pantropical and often warm temperate, most abundant in Africa, with more than 400 species, many of which have been used as fish poisons or as cover crops. Three species are recorded from Fiji, one indigenous and the others introduced but probably not yet naturalized.

KEY TO SPECIES

Hairs (at least some of them) on calyx and on pod sutures brown or black, 0.4-1 mm. long, the pods densely fulvo-pubescent; upper pair of calyx teeth about 1.5 mm. long, united for about 3/4 their length, shorter than calyx tube, the lowest tooth attenuate, about 6 mm. long, much longer than upper teeth; standard 8-12 mm. long, densely brown-sericeous without; leaflets (9-) 11-25, sericeous beneath, with 8-17 pairs of lateral nerves and without an obvious veinlet-reticulation; cultivated only. . . . 1. *T. noctiflora*

Hairs on calyx and on pod sutures white or yellowish; upper pair of calyx teeth united for about 1/3 their length, longer than calyx tube, the lowest tooth not much longer than upper teeth; leaflets 7-17.

Fruits copiously spreading-pale-pilose (hairs obscuring surface, 1-2 mm. long); calyx spreading-pilose, the teeth long-acuminate, the lowest one to 8 mm. long, the others nearly as long; standard 10-15 mm. long, copiously fulvo-sericeous without; leaflets pale-sericeous beneath, with 7-9 pairs of lateral nerves and without an obvious veinlet-reticulation; cultivated only. 2. *T. villosa*

Fruits shortly and inconspicuously strigillose (hairs not concealing surface, less than 0.5 mm. long); calyx appressed-strigillose to sericeous, the teeth narrowly deltoid, the lowest one 2.5-3 mm. long, the others 2-2.5 mm. long; standard 6-9 mm. long, shortly whitish-strigillose without; leaflets closely and inconspicuously strigillose beneath, with 6-12 pairs of lateral nerves interconnected by a prominent veinlet-reticulation; indigenous, frequent in coastal areas and occasional inland.

3. *T. purpurea*

1. ***Tephrosia noctiflora*** Bojer ex Baker in Oliver, Fl. Trop. Afr. 2: 112. 1871; J. B. Gillett in Fl. Trop. E. Afr. Leg. Papil. 182. 1971; J. W. Parham, Pl. Fiji Isl. ed. 2. 119. 1972; Verdcourt, Man. New Guinea Leg. 344. fig. 77. A. 1979.

A straggling annual or short-lived perennial 0.5-1.5 m. high, cultivated near sea level. The petals are yellow without, purple and white within; the fruits are linear, 4-5 cm. x 4-6 mm., with 6-11 seeds about 4 mm. long. Our dated material was in flower and fruit in August.

TYPIFICATION: The type is *Bojer s. n.* (K HOLOTYPE), from Zanzibar Island.

DISTRIBUTION: Eastern Africa and Madagascar to India, cultivated and often naturalized elsewhere.

USE: The species is often cultivated as a cover crop and was doubtless introduced for that purpose, but perhaps it is not yet widely used. In some areas it is used as a fish poison.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Plant Introduction and Quarantine Station, Nanduruloulou, DA 8490 (FDA 13678), DA, Pl. Introd. no. 13678, no. 14893. FIJI without further data, DA 12978 (FDA 15529).

2. *Tephrosia villosa* (L.) Pers. Syn. Pl. 2: 329. 1807; J. B. Gillett in Fl. Trop. E. Afr. Leg. Pabil. 190. 1971; J. W. Parham, Pl. Fiji Isl. ed. 2. 119. 1972.

Cracca villosa L. Sp. Pl. 752. 1753.

An annual or brief, suffruticose perennial to 1 m. high, sparingly cultivated near sea level. The terminal pseudoracemes are up to 20 cm. long or the flowers are fasciculate and axillary, the petals purple, the keel being glabrous. The strongly curved, often deflexed fruits are 4.5–5.5 cm. \times 3–6 mm., with 6–14 seeds about 4 mm. long. Our material was in flower and fruit in May.

TIPIFICATION: The type is *Hermann* (BM HOLOTYPE), from Ceylon.

DISTRIBUTION: Africa and Madagascar to India and Ceylon, sometimes cultivated elsewhere as a cover crop and sometimes naturalized. Our material seems to represent subsp. *villosa*, which does not occur in Africa.

USE: In Fiji this species has been introduced for trial but is probably not established.

AVAILABLE COLLECTION: VITI LEVU: NANDRONGA & NAVOSA: Agricultural Station, Nathotholevu, Singatoka, DA 10839.

3. *Tephrosia purpurea* (L.) Pers. Syn. Pl. 2: 329. 1807; Benth. in London J. Bot. 2: 217. 1843; Seem. in Bonplandia 9: 255. 1861, Viti, 435. 1862; Drake, Ill. Fl. Ins. Mar. Pac. 148. 1890; Gibbs in J. Linn. Soc. Bot. 39: 144. 1909; Greenwood in Proc. Linn. Soc. 154: 97. 1943; Yuncker in Bishop Mus. Bull. 178: 62. 1943, in op. cit. 220: 139. 1959; J. W. Parham, Pl. Fiji Isl. 77. 1964, ed. 2. 119. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 161. 1970; J. B. Gillett in Fl. Trop. E. Afr. Leg. Pabil. 186. 1971; St. John & A. C. Sm. in Pacific Sci. 25: 328. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 21. 1972; Verdcourt, Man. New Guinea Leg. 345. 1979. FIGURE 36.

Cracca purpurea L. Sp. Pl. 752. 1753.

Galega piscatoria Ait. Hort. Kew. 3: 71. 1789; forsan non sensu str.

Tephrosia piscatoria Pers. Syn. Pl. 2: 329. 1807; A. Gray, Bot. U. S. Expl. Exped. 1: 407. 1854, in Proc. Amer. Acad. Arts 5: 317. 1862, in Bonplandia 10: 35. 1862; Seem. Fl. Vit. 55. 1865; Christophersen in Bishop Mus. Bull. 128: 100. 1935; forsan non sensu str.

An erect or spreading annual or a short-lived, subliguous perennial, occasional but not abundant at elevations from near sea level to 300 m. on rocky shores and rocky slopes and open places, infrequently inland. The inflorescences are slender, lax, leaf-opposed pseudoracemes up to 20 cm. long; flowers have the standard white-pubescent without and reddish purple to pink within, the wings pink, and the keel petals green to purple and glabrous. The fruits are 3–5 cm. \times 3–5 mm. and bear 5–9 seeds about 3 mm. long. Flowers and fruits are noted to occur between February and July.

TIPIFICATION AND NOMENCLATURE: The type of *Cracca purpurea* is *Hermann* (BM HOLOTYPE), from Ceylon. *Galega piscatoria* is based on a cultivated plant (BM HOLOTYPE) said to have been introduced in 1778 by Patrick Russell. Aiton's name has generally been reduced to the synonymy of *Tephrosia purpurea*, but Verdcourt (1979, cited above) expresses some doubt of this placement.

DISTRIBUTION: Africa (Natal) to southern Asia and eastward through Malesia to tropical Australia and to the Tuamotu Islands, introduced elsewhere. It could have been an aboriginal introduction as a fish poison in the eastern parts of its range, but there is no real indication that it is not indigenous in Fiji and eastward. Subspecies and



FIGURE 36. *Tephrosia purpurea*: A, distal portion of branchlet, with foliage and infructescences, $\times 1/4$; B, flower, with one wing and one keel petal removed, $\times 6$. A from DA 5759, B from Smith 1389.

varieties have been named; presumably our material represents subsp. *purpurea*, which appears not to be indigenous in Africa.

LOCAL NAME AND USES: Locally known as *tukavei*, *Tephrosia purpurea* was formerly used as a fish poison. In the Yasawas it is reputed to be used medicinally for earache.

AVAILABLE COLLECTIONS: YASAWAS: WAYA: Nakawa Gulch, west of Mbatinaremba, *St. John* 18137. MAMANUTHAS: NGGALITO Island, Malolo Group, *O. & I. Degener* 32207. VITILEVU: MBA: Vicinity of Lautoka, *Greenwood* 404, 404Z; foot of Korolevu (probably the Korolevu on Ra boundary, $17^{\circ}30'S.$), *Gibbs* 766. NANDRONGA & NAVOSA: Savusavu, Malomalo Tikina, *Greenwood* 293. REWA: Nukulau Island, *Barclay* 3437 (BM), *s. n.* (K). WAKAYA: *Milne* 381. NGAU: Hills east of Herald Bay, inland from Sawaieke, on slopes of Mt. Vonda toward Waikama, *Smith* 7954. VANUA LEVU: MATHUATA: *Seemann* 107. RAMBI: Ngaloa, DA 5759, 5762. MOALA: North coast, *Smith* 1389. MATUKU: *Milne* 112. TOTOYA: *Milne* 80. FULANGA: On limestone formation, *Smith* 1106. ONGEA LEVU: *Bryan* 429 (coll. R. H. Beck). FIJI without further locality, *U. S. Expl. Exped.*

15. GLIRICIDIA H. B. K. *Nova Gen. et Sp.* 6: ed. fol. 309 (July), ed. qu. 393 (Sept.). 1824; Hutchinson, *Gen. Fl. Pl.* 1: 368. 1964; Verdcourt, *Man. New Guinea Leg.* 347. 1979.

Trees or shrubs, with small stipules; leaves imparipinnate, estipellate, the leaflet blades entire; inflorescences axillary, racemose, often clustered at older nodes, the flowers borne singly on rachis, the bracts small, the bracteoles none; calyx cupuliform,

the limb subtruncate, with short teeth, the 2 upper ones subconnate; petals 5, the standard large, reflexed, sometimes with small, inflexed auricles, the wings falcate-oblong, free, the keel petals incurved; stamens 10, the filaments of 9 connate into a sheath, the vexillary filament free, the anthers uniform; ovary stipitate, the ovules several, the style inflexed, the stigma small; fruits stipitate, linear-oblong, compressed, not partitioned, dehiscent, the valves coriaceous, becoming spirally coiled.

TYPE SPECIES: *Gliricidia sepium* (Jacq.) Kunth ex Walp. (*Robinia sepium* Jacq.).

DISTRIBUTION: Tropical America, with 4-9 species, one of which is in cultivation in Fiji.

1. *Gliricidia sepium* (Jacq.) Kunth ex Walp. Rep. Bot. Syst. 1: 679. 1842; J. W. Parham, Pl. Fiji Isl. 74. 1964, ed. 2. 113. 1972; Verdcourt, Man. New Guinea Leg. 348. fig. 78. 1979; Henty in Papua New Guinea Dept. Forests Bull. 12: 88. fig. 52. 1980.

Robinia sepium Jacq. Enum. Syst. Pl. Carib. 28. 1760.

A shrub or small tree to 8 m. high, cultivated near sea level, the leaves with 7-17 leaflets of which the blades are elliptic-oblong, usually 3-6 × 1.5-3.5 cm., and often with bronze blotches beneath. The inflorescences are 5-13 cm. long and the flowers have the calyx red-tinged and the petals rose-pink, the standard and keel partly yellowish. The fruits, at length blackish, are up to 15 × 1.5 cm., with 3-8 purplish brown seeds up to 1 cm. long.

TYPIFICATION: Jacquin did not indicate a type in his original publication, but probably the species is based on his own material from the West Indies.

DISTRIBUTION: Mexico to northern South America, naturalized in the West Indies and frequently cultivated elsewhere in tropical areas.

LOCAL NAMES AND USES: In Fiji only the name *gliricidia* has been used, but in America the well-known name *madre de cacao* is widespread. Although no herbarium vouchers are available, Parham (cited above) states that the species was introduced in 1932 and was established as a shade for plantation crops (presumably cocoa and coffee) and as living fence posts. It is also a striking ornamental or shade tree and is said to be locally common in Fiji.

16. *SESBANIA* Scop. Introd. Hist. Nat. 308. 1777; Hutchinson, Gen. Fl. Pl. 1: 402. 1964; J. B. Gillett in Fl. Trop. E. Afr. Leg. Papiil. 330. 1971; Verdcourt, Man. New Guinea Leg. 358. 1979. Nom. cons.

Agati Adanson, Fam. Pl. 2: 326, 513. 1763. Nom. rejic.

Sesban Adanson, Fam. Pl. 2: 327, 604. 1763. Nom. rejic.

Small trees, shrubs, or herbs, the stipules often fugacious, the indument of simple, pale hairs; leaves paripinnate, usually stipellate, the rachis channelled above, the leaflets many (usually more than 10 pairs), the blades entire; inflorescences axillary, racemose, the pedicels usually borne singly, articulate distally, the bracts and bracteoles usually fugacious; calyx campanulate, with subequal teeth shorter than tube; petals 5, the standard orbicular to ovate, spreading or reflexed, with a variously appendaged claw, the wings falcate-oblong, transversely ribbed, short-clawed, the keel petals incurved, long-clawed; stamens 10, the filaments of 9 connate into a sheath longer than free parts, the vexillary filament free, curved near base, the anthers uniform, dorsifixed; ovary often stipitate, the ovules numerous, the style incurved, the stigma small, capitate; fruits linear and usually becoming subterete, rarely subcompressed, rarely winged (not in our species), dehiscent (sometimes tardily so), rostrate, transversely septate, the seeds 6-50, ellipsoid, often narrowly rim-arillate around hilum.

TYPE SPECIES: *Sesbania sesban* (L.) Merr. (*Aeschynomene sesban* L.).

DISTRIBUTION: Pantropical and subtropical, often in seasonally wet habitats, with about 50 species. Four species are known from Fiji, one indigenous and the others cultivated, naturalized, or adventive.

USEFUL TREATMENTS OF GENUS: GILLETT, J. B. *Sesbania* in Africa (excluding Madagascar) and southern Arabia. Kew Bull. 17: 91-159. 1963. BURBRIDGE, N. T. The Australian species of *Sesbania* Scopoli (Leguminosae). Austral. J. Bot. 13: 103-141. 1965.

KEY TO SPECIES

Filaments 30-60 mm. long, curved for much of their length; petals at least 23 mm. long; calyx (including limb and teeth) at least 8 mm. long; mature leaflet blades 15-42 × 5-14 mm.

Leaflets in 10-25 pairs; calyx (including limb and teeth) 20-30 mm. long; petals 5-10 cm. long, pure white (to dark red in some forms); fruits at maturity up to 60 cm. long and 9 mm. broad, the stipe 25-50 mm. long, the septa 8-14 mm. apart, the beak 25-30 mm. long (soon breaking off); cultivated and sometimes naturalized. 1. *S. grandiflora*

Leaflets in 8-13 pairs; calyx (including limb and teeth) 8-15 mm. long; petals 2.3-3.2 cm. long, pinkish yellow or cinereous-yellow, with deep red-brown lines; fruits at maturity (13-) 18-21 cm. long and up to 8 mm. thick, the stipe 10-20 mm. long, the septa 6-9 mm. apart, the beak 5-10 mm. long (soon breaking off); indigenous. 2. *S. coccinea*

Filaments 8-12 mm. long, upcurved only distally; petals 8-15 mm. long; calyx (including limb and teeth) 3-5 mm. long; septa of fruits 4-6 mm. apart; mature leaflet blades not more than 25 × 4 mm.

Stems and leaf rachises glabrous (or very sparsely pilose when young and soon glabrate); retrorse prickles (0.1-0.8 mm. long, broad-based) present on stems and often on leaf rachises; leaves in our material with (4-) 7-17 pairs of leaflets with blades 4-13 × 1.5-3 mm. (in species as a whole up to 55 pairs with blades up to 20 × 3 mm.) and glabrous on both sides even when very young; inflorescences in our material 1- or 2-flowered, the pedicels 3-6 mm. long (to 11 mm. long in species as a whole, with as many as 12 flowers per inflorescence); blade of standard about as broad as long; fruits at maturity 20-25 cm. long and 2-3.5 mm. in diameter, the beak 10-12 mm. long (soon breaking off); adventive. 3. *S. bispinosa*

Stems and leaf rachises moderately pale-sericeous with hairs about 0.5 mm. long (presumably at length subglabrate), not aculeate; leaves with (11-) 25-45 pairs of leaflets with blades 12-25 × 2.5-4 mm. and subsperisately sericeous at least beneath; inflorescences (3-) 6-9-flowered, the pedicels 6-10 mm. long; blade of standard slightly broader than long; fruits at maturity 15-20 cm. long and 3-4 mm. in diameter, the beak 5-8 mm. long (soon breaking off); cultivated only. 4. *S. cannabina*

1. ***Sesbania grandiflora*** (L.) Poir. in Lam. Encycl. Méth. Bot. 7: 127. 1806; Yuncker in Bishop Mus. Bull. 220: 139. 1959; J. B. Gillett in Kew Bull. 17: 105. 1963; J. W. Parham, Pl. Fiji Isl. 76. 1964, ed. 2. 118. 1972; Verdcourt, Man. New Guinea Leg. 360. fig. 83. 1979.

Robinia grandiflora L. Sp. Pl. 722. 1753.

Agati grandiflora Desv. in J. Bot. Agric. 1: 120. 1813.

A tree 4-12 m. high, cultivated near sea level in gardens and villages, and also occasionally naturalized. The inflorescences are 2-4-flowered, and in Fiji only the form with pure white petals and styles has been noted; however, other forms attributed to the species have the petals shading to dark red. Our material bore flowers and fruits in June and July.

TYPIFICATION: Linnaeus cited earlier references for *Robinia grandiflora*, but a lectotypification has not been noted.

DISTRIBUTION: As the species has long been cultivated as an ornamental, its place of origin is questionable but may have been Indo-Malesia. The related Australian species is considered distinct as *Sesbania formosa* (F. v. Muell.) Burbidge (in Austral. J. Bot. 13: 115. 1965).

LOCAL NAMES AND USE: In Fiji the species passes by its Tamil name, *agati* or *agathi*. It is a beautiful ornamental, which may have been first introduced into Fiji by J. B. Thurston, who listed it in his 1886 *Catalogue* (as *Agati grandiflora*). Thurston also listed "*Agati speciosa*. East Indies," which I cannot interpret.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Nanduruloulou, in Cocoa Station nursery, DA 12251. REWA: Suva Botanical Gardens, DA 12098. NGAU: Shores of Herald Bay, vicinity of Sawaike, Smith 7996.

2. *Sesbania coccinea* (L. f.) Poir. in Lam. Encycl. Méth. Bot. 7: 127, as *Sesban c.* 1806; Seem. Fl. Vit. 55. 1865. FIGURES 37, 38.

Aeschynomene coccinea L. f. Suppl. Pl. 330. 1782; Murray, Syst. Veg. ed. 14. 671. 1784; Forst. f. Fl. Ins. Austr. Prodr. 51. 1786.

Sesbania tomentosa f. *arborea* sensu Greenwood in Proc. Linn. Soc. 154: 93. 1943; non Rock.

Sesbania tomentosa sensu J. W. Parham, Pl. Fiji Isl. 77. 1964, ed. 2. 118. 1972; non Hook. & Arn.

Sesbania atollensis sensu A. C. Sm. in Allertonia 1: 401. 1978; forsan non St. John (1962) sensu str.

As seen in Fiji, *Sesbania coccinea* is a shrub or small tree 1–5 m. high, occurring near sea level along sandy beaches and sometimes in coconut plantations, on soil presumably derived from limestone. Its petals are pinkish yellow or cinereous-yellow, with deep red-brown lines. The fruits become brown at maturity and then are (13–) 18–21 cm. long and up to 6 mm. broad and 8 mm. thick (subterete but thicker than broad), with seeds up to $7 \times 4 \times 2$ mm. Our specimens bore flowers and fruits in March, May, and August.

TIPIFICATION AND NOMENCLATURE: In describing his new species *Sesbania atollensis*, then known from the Society Islands and Tuamotu Archipelago eastward to Henderson Island, St. John (in Trans. Roy. Soc. New Zealand Bot. 1: 184. fig. 9. 1962) pointed out its identity with *S. speciosa* F. Br. (in Bishop Mus. Bull. 130: 110. 1935). Brown's binomial was a later homonym of the African *S. speciosa* Taub. ex Engl. (1894), and it was also illegitimate because it was apparently based on *Aeschynomene speciosa* Solander (a binomial published only in synonymy by Seemann, Fl. Vit. 55. 1865). In referring Fijian collections to *S. atollensis* in 1978, I neglected to pursue the fact that Seemann had referred Solander's manuscript name (which is supported by a beautiful Parkinson drawing at BM) to a valid binomial, *S. coccinea* Poir. *Sesbania coccinea* has as its basionym *A. coccinea* L. f., which originally (1782) was cited as: "Habitat in Nova Zeelandia. Eques Bäck. Flores maiores, rubri." The mention of New Zealand has misled students of *Sesbania*, since no New Zealand species suggests that of the younger Linnaeus, and St. John did not associate a New Zealand species with his Polynesian taxon.

Fortunately, M.-H. Sachet has further investigated the matter and has examined the holotype of *Aeschynomene coccinea* L. f. (LINN in J. E. Smith Herbarium). The specimen is doubtless a J. R. and G. Forster collection from the second Cook voyage (some of the "Bäck" material having reached the younger Linnaeus and subsequently J. E. Smith, cf. Merrill in Chron. Bot. 14: 208. 1954) that has now been marked "prob. New Caledonia." It is no doubt part of the material that G. Forster (1786) redescribed as *A. coccinea*, assigning it the localities: "Societatis insulae, Botanicesque insula." The LINN specimen is probably from "Botanists' Island" (modern name: Île Améré), between the mainland of New Caledonia and the Isle of Pines. There is also a Forster specimen at UPS (in the Thunberg collection) which is obviously a duplicate, with the correct localities. This specimen may have material from both of the localities mentioned by G. Forster.

The above data in large part were kindly supplied to me by M.-H. Sachet (in litt.), who has in preparation a discussion of *Sesbania coccinea* and *S. atollensis*. Her treatment of the problem, which may be in print prior to the present volume of this *Flora*, will illuminate a puzzling problem.

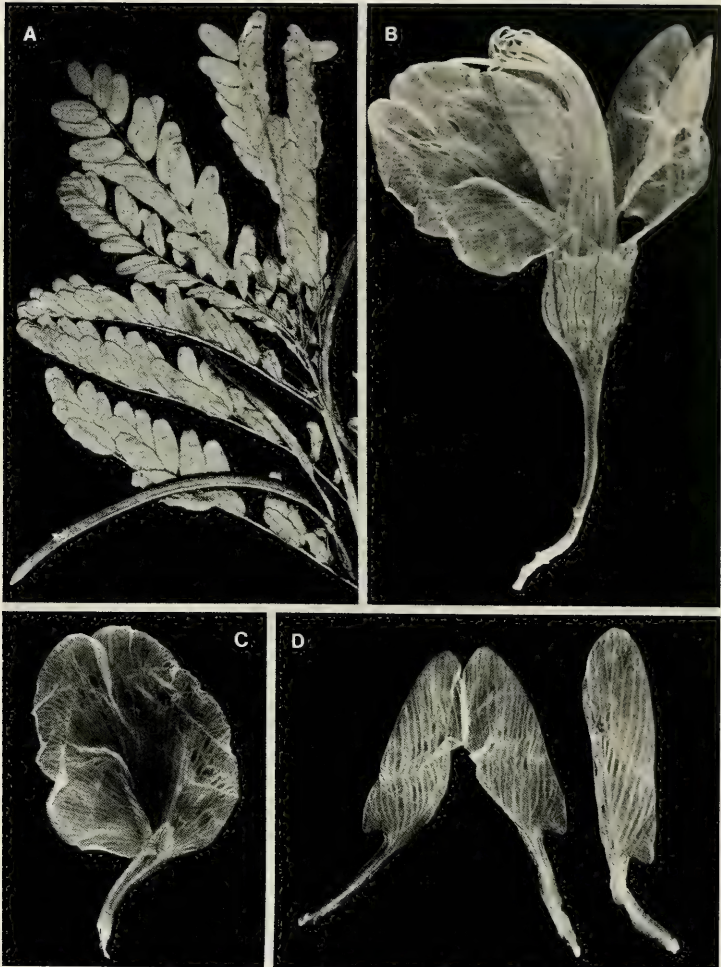


FIGURE 37. *Sesbania coccinea*; A, distal portion of branchlet, with foliage, an inflorescence, and young fruits, $\times 1/3$; B, flower with 1 wing removed, $\times 2$; C, standard, $\times 2$; D, keel petals and a wing, $\times 2$. A from Bryan 517, B-D from DA 15540.

Mentions of *Sesbania tomentosa* (a Hawaiian endemic) in the above synonymy are based solely on misidentifications of *Tothill 103*, from Nayau, Fiji, cited below.

DISTRIBUTION: Specimens of *Sesbania coccinea* are now known from the Isle of

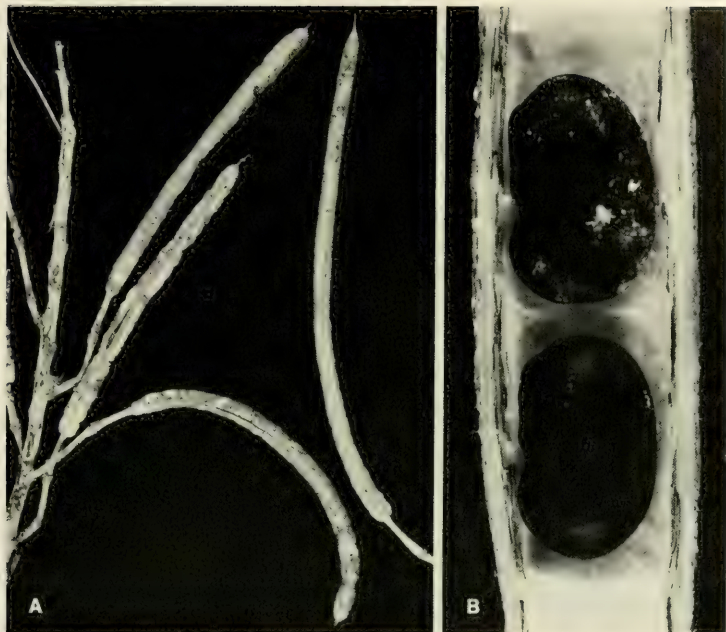


FIGURE 38. *Sesbania coccinea*, from Bryan 443: A, mature fruits, $\times 1/2$; B, sectioned portion of fruit with seeds, $\times 6$.

Pines and nearby islands (but not from mainland New Caledonia) and the Loyalty Islands (fide Sachet, in litt.), as well as from Fiji (cited below) and Tonga (Vava'u: Crosby 46 (κ) (F. R. Fosberg, personal communication)). In Fiji it is now known from five islands of the Lau Group. Whether or not the concept of *S. coccinea* should be expanded to include the eastern Polynesian *S. atollensis* is discussed below.

LOCAL NAME: *Vaivai*.

AVAILABLE COLLECTIONS: YATHATA: Namberavula, DA 15540, 15541. VATU VARA: DA 17708. NAYAU: Tothill 103. MARAMBO: Bryan 517. FULANGA: Bryan 443.

Sesbania atollensis is closely related to *S. coccinea* and may possibly be separable only at an infraspecific level, a problem under study by Dr. Sachet; neither taxon has been recorded from islands between Tonga and the Societies. A comparison of Fijian material (which apparently may safely be assigned to typical *S. coccinea*) and *S. atollensis* indicates that the latter often has slightly the longer leaves, more numerous and sometimes larger leaflets, somewhat larger flowers (flowers in Fiji have the standard blade no larger than 22×19 mm., the wings to 30×6 mm., the keel petals to 29×7 mm., and the stamens to 30 mm. in length), and different fruits (dimensions of Fijian fruits are noted above). These data suggest that material of the complex from eastern Polynesia may represent one or more taxa separable at some level from *S. coccinea*.

3. *Sesbania bispinosa* (Jacq.) W. F. Wight in U. S. Dept. Agr. Bur. Pl. Indust. Bull. 137: 15. 1909; J. B. Gillett in Kew Bull. 17: 129. 1963, in Fl. Trop. E. Afr. Leg. Pabil. 349. fig. 51 (11, 12). 1971.

Aeschynomene sesban sensu Jacq. Collect. 2: 283. 1788; non L.
Aeschynomene bispinosa Jacq. Icon. Pl. Rar. 3: 13. pl. 564. 1792.
Sesbania aculeata Poir. in Lam. Encycl. Méth. Bot. 7: 128, nom. illeg. 1806.

TYPIFICATION AND NOMENCLATURE: The type is a plant of unknown origin, probably Asiatic, cultivated in Vienna prior to 1788 and illustrated in Jacquin's 1792 work. *Sesbania aculeata* (Willd.) Poir. is based on *Coronilla aculeata* Willd. (Sp. Pl. 3: 1147. 1802, an illegitimate name because it is based on the same plant as Jacquin's name). The oldest epithet for the concept is found in *Aeschynomene aculeata* Schreber (1770), but Poiret's combination prevents its use in *Sesbania*.

DISTRIBUTION: India and China southward through much of Africa and in Madagascar and Mauritius, probably as an introduced weed in much of this range as well as in many other tropical areas.

Fijian collections belong to the following variety.

- 3a. *Sesbania bispinosa* var. *micrantha* (Chiov.) J. B. Gillett in Kew Bull. 17: 130. 1963.

Sesbania aculeata var. *micrantha* Chiov. Fl. Somalia 2: 164. 1932.
Sesbania bispinosa sensu Greenwood in Proc. Linn. Soc. 154: 97. 1943; J. W. Parham, Pl. Fiji Isl. 76. 1964; non sensu str.
Sesbania aculeata sensu J. W. Parham in Dept. Agr. Fiji Bull. 35: 89. 1959; non Poir. sensu str.
Sesbania sesban sensu J. W. Parham, Pl. Fiji Isl. 77. 1964; non Merr.
Sesbania cannabina sensu J. W. Parham, Pl. Fiji Isl. ed. 2. 118. 1972; non Poir.

As seen in Fiji, *Sesbania bispinosa* var. *micrantha* is a shrub or coarse herb to 1.5 m. high, locally naturalized near sea level as a weed along roadsides, in waste places, and in cultivated fields; it is often common in damp places in areas with a pronounced seasonal climate. The petals are yellow. As far as our collections are dated, flowers and fruits have been noted in May and July.

TYPIFICATION: Variety *micrantha* is typified by *Senni 446* and *490* (FI SYNTYPES), collected in Somalia in July, 1929. All the above references to names used by Greenwood and Parham refer to the weed of cultivation established on the lee coast of Viti Levu and not to *Sesbania cannabina*, which, however, is sparingly cultivated in Fiji.

DISTRIBUTION: The variety has a very spotty distribution in the tropics as a weed of subsaline seasonally wet areas, reported by Gillett (1963) from India, Fiji (*Greenwood 739*), and British Guiana, as well as Somalia. It is commonly found in cultivated areas, including rice fields, and it probably has a much wider distribution, perhaps including at least some of the material referred to *Sesbania bispinosa* in Java (Backer & Bakh. f. Fl. Java 1: 597. 1963).

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Near Tavua, *DA 14360*. RA: Near Thamboni, *DA 11470*; Penang, *Greenwood 747*; Ellington, *Greenwood 739*, *DA 2831*. FIJI without further locality, *DA L.13845*. Parham (1959, 1964, 1972, cited above) also indicates that the taxon is established in Mbua Province, Vanua Levu, but no vouchers are available.

Variety *micrantha*, which differs from var. *bispinosa* in having the inflorescences 1- or 2-flowered (rather than 3-12-flowered) and the filament sheath only about 8 mm. long (rather than 9-12 mm. long), seems worthy of recognition. If our material is typical of the variety, its leaves have only (4-) 7-17 pairs of leaflets rather than 25-55 pairs, as in var. *bispinosa*.

4. *Sesbania cannabina* (Retz.) Poir. in Lam. Encycl. Méth. Bot. 7: 130. 1806; Roxb. Fl. Ind. ed. 2. 3: 335. 1832; J. B. Gillett in Kew Bull. 17: 130. 1963; Burbidge in Austral. J. Bot. 13: 118. 1965; Verdcourt, Man. New Guinea Leg. 360. fig. 82. 1979.

Aeschynomene cannabina Retz. Obs. Bot. 5: 26. 1789.

A low shrub or herb up to 3 m. high, sparingly cultivated in experimental plots near sea level. The petals are yellow, the standard streaked with red or purple; our material bore flowers and fruits in May.

TIPIFICATION AND NOMENCLATURE: Retzius presumably based his concept on Koenig material from India, but the actual specimen may no longer exist. Gillett (1963, cited above) discusses the nomenclatural issues in detail; it is possible that Retzius actually described a specimen of *Sesbania procumbens* (Roxb.) Wight & Arn., but *S. cannabina* is generally accepted in the sense used by Roxburgh in 1832, that is, as the fiber-yielding species known in India as *dhunchi* (or *dhaincha*, cf. Burkill, Dict. Econ. Prod. Malay Penins. ed. 2. 2032. 1966). If the species is subdivided (e. g. Burbidge, 1965, cited above), our material falls into var. *cannabina*.

DISTRIBUTION: Probably indigenous in Australia and islands to the north, but early widespread in Malasia and southeastern Asia to India and China, and perhaps in parts of Africa. It has been confused with *Sesbania bispinosa*, Gillett's table (1963, p. 132) of distinguishing characters readily permitting separation.

LOCAL NAMES AND USES: No names are noted in Fiji, but this is the plant known in India as *dhunchi* or *dhaincha*. *FDA 16065* was introduced into Fiji in 1965, but no source or name was indicated in Dept. Agr. Fiji Introduction List No. 12, p. 12. 1965. Perhaps the species has not become naturalized in Fiji; in other areas it is utilized as a green manure, and its fiber may be made into fishing lines and nets.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mba closed area, *DA 14357 (FDA 16065)*. NANDRONGA & NAVOSA: Agricultural Station, Nathotholevu, near Singatoka, *DA 9787*.

17. *INDIGOFERA* L. Sp. Pl. 751. 1753; Seem. Fl. Vit. 54. 1865; Hutchinson, Gen. Fl. Pl. 1: 400. 1964; J. B. Gillett in Fl. Trop. E. Afr. Leg. Papil. 212. 1971; Verdcourt, Man. New Guinea Leg. 348. 1979.

Shrubs or herbs, the indument copious to sparse, usually partially composed of biramous hairs, the stipules often small and setaceous; leaves imparipinnate (in all our taxa) or 3- or 1-foliolate or simple, very rarely paripinnate, stipellate or not, the leaflet blades entire, with obscure lateral nerves; inflorescences axillary, racemose or spicate, infrequently paniculate, the flowers borne singly in axils of caducous bracts, the bracteoles none; calyx with the lobes or teeth subequal or the lowermost one the longest; petals 5, usually red to pink, caducous (or standard persistent), the standard longer than broad, gradually narrowed to base, the wings short-clawed or not, the keel petals erect, gibbous or calcarate on each side, short-clawed; stamens 10, the filaments of 9 connate into a persistent tube, the vexillary filament free from base, the anthers uniform, dorsifixed, apiculate; ovary usually sessile, the ovules mostly numerous, infrequently only 2, the stigma capitate, often penicillate; fruit linear to ovoid, straight or curved, subterete or tetragonal or compressed, septate between seeds, dehiscent, the seeds (1-) 2-many, globose to cylindrical.

LECTOTYPE SPECIES: *Indigofera tinctoria* L. (vide Britton & Brown, Ill. Fl. N. U. S. ed. 2. 2: 371. 1913), one of Linnaeus's three original species.

DISTRIBUTION: Pantropical and subtropical, with about 700 species; five species are recorded from Fiji, two of them furnishing indigo and now naturalized, the others sparingly cultivated and perhaps still limited to introduction gardens.

An interesting discussion of the many uses of various species of *Indigofera* is provided by Burkill, Dict. Econ. Prod. Malay Penins. ed. 2. 1252-1260. 1966.

KEY TO SPECIES

Leaflets opposite; pedicels 1 mm. or more long; erect or sprawling herbs or shrubs often more than 1 m. high.
Fruits straight or curved; leaflet blades 7-30 × 4-17 mm.; woody herbs or low shrubs 0.5-2.5 m. high or subscandent, the indument of stems, rachises, calyces, and fruits fine, appressed, never very dense, the hairs pale.

Racemes up to 27 cm. long (seldom as short as 5 cm. at anthesis), the peduncle up to 3 cm. long; calyx 2.5-4 mm. long, the lobes subulate-setaceous, much longer than tube; fruits straight or slightly curved, somewhat tetragonal, 20-30 mm. long, about 1.3 mm. broad and 2 mm. thick, white-strigillose, the seeds about 10; leaflets in our variety 5-9, the blades 8-30 × 5-17 mm.; erect, woody herb 0.5-2 m. high, sometimes subscandent. 1. *I. trita*

Racemes up to 5 cm. long but usually shorter, sessile (epedunculate); calyx about 1.5 mm. long, the lobes deltoid, about as long as tube; leaflets 5-19, the blades up to 28 × 16 mm.; erect or sprawling shrubs up to 2.5 m. high.

Fruits strongly curved, 10-15 mm. long, 2-3 mm. broad and thick, the seeds 3-5; leaflet blades 12-28 × 4-12 mm. 2. *I. suffruticosa*

Fruits straight or slightly curved, linear, 25-35 mm. long, about 2 mm. broad and thick, the seeds 8-12; leaflet blades 7-25 × 5-16 mm. 3. *I. tinctoria*

Fruits straight, somewhat tetragonal, 12-20 mm. long, about 2 mm. broad and thick, the seeds 6-9; racemes 20-30 cm. long, the peduncle 2.5-8 cm. long; calyx about 4 mm. long, divided nearly to base, with linear-setaceous lobes; leaflets 5-7 (-9), the blades up to 45 × 25 mm., densely pilose on both sides; erect or spreading subligneous herbs up to 1.5 m. high, the stems, rachises, calyces, and fruits stiffly and copiously brown-hirsute with long hairs. 4. *I. hirsuta*

Leaflets alternate or very rarely opposite, 5-11 (usually 7), the blades about 10 mm. long (but very variable, 3-30 mm. long in some forms); racemes up to 15 cm. long, the peduncle 1-4 cm. long; pedicels about 0.5 mm. long; calyx 2-3 mm. long, divided nearly to base; fruits linear, straight, 11-25 mm. long, about 2 mm. broad and thick, the seeds 5-8; prostrate or ascending annual herbs with stems up to 60 cm. long, the stems, rachises, calyces, and fruits appressed-strigillose. 5. *I. spicata*

1. *Indigofera trita* L. f. Suppl. Pl. 335. 1782; J. B. Gillett in Fl. Trop. E. Afr. Leg. Papil. 303. 1971.

TYPIFICATION: The type of *Indigofera trita* is a collection from India by an unknown collector (LINN 923-9 HOLOTYPE).

DISTRIBUTION: The typical variety occurs from Pakistan eastward to Malesia and Australia; other varieties extend the range of the species southward to Africa and Madagascar. Only var. *scabra* has been brought into Fiji.

1a. *Indigofera trita* var. *scabra* (Roth) Ali in Bot. Not. 3: 558. 1958; J. B. Gillett in Fl. Trop. E. Afr. Leg. Papil. 304. fig. 43 (1). 1971; Verdcourt, Man. New Guinea Leg. 356. 1979.

Indigofera scabra Roth, Nov. Pl. Sp. 359. 1821.

Indigofera subulata sensu J. W. Parham, Pl. Fiji Isl. ed. 2. 114. 1972; non Poir.

In Fiji this variety, cultivated in nursery plots near sea level, is a somewhat ligneous herb to 50 cm. high, with pink petals, flowering in April, September, and October.

TYPIFICATION: The type of *Indigofera scabra* is *Wallich 5475* ex Herb. Heyne (ISOTYPE at K), from Madras Province, India. Our material of *I. trita* belongs in var. *scabra* rather than var. *subulata* (Poir.) Ali, which has only three leaflets.

DISTRIBUTION: Africa and Madagascar to India, cultivated elsewhere.

USE: Introduced into Fiji, probably since 1940, as a potential cover crop, but not established because of its believed potential toxicity to cattle.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Agricultural Station, Nathotholevu, near Singatoka, *DA 14754*. NAITASIRE: Plant Introduction and Quarantine Station, Nanduruloulou, *DA 9558, 9668 (FDA 13403)*.

2. *Indigofera suffruticosa* Mill. Gard. Dict. ed. 8. 1768; Merr. Interpret. Rumph. Herb. Amb. 264. 1917; Christophersen in Bishop Mus. Bull. **128**: 100. 1935; Greenwood in Proc. Linn. Soc. **154**: 97. 1943; Yuncker in Bishop Mus. Bull. **220**: 138. 1959; J. W. Parham in Dept. Agr. Fiji Bull. **35**: 90. 1959, Pl. Fiji Isl. ed. 2. 114. 1972; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 49. 1972; Verdcourt, Man. New Guinea Leg. 355. fig. 80 (*F*). 1979.

Indigofera anil L. Mant. Pl. Alt. 2: 272. 1771; Seem. in Bonplandia 9: 255. 1861, Viti, 435. 1862, Fl. Vit. 54. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 147. 1890.

Indigofera tinctoria sensu J. W. Parham, Pl. Fiji Isl. 74. 1964; non L.

As seen in Fiji, *Indigofera suffruticosa* is a shrub 0.6–2 m. high, occurring from near sea level to about 300 m. and often locally abundant in dry areas along roadsides, in waste places, cultivated areas such as canefields and coconut plantations, and pastures, and along beaches and on open hillsides. The petals are greenish but copiously tinged with salmon-pink or orange-red; flowers and fruits have been noted throughout the year.

TYPIIFICATION AND NOMENCLATURE: *Indigofera suffruticosa* is based on Sloane, "Cat. Jam. 142," the HOLOTYPE presumably being at BM. No reference or specimen was cited in the protologue of *I. anil*, said to have come from India, but a specimen may exist at LINN. The two concepts are now firmly established as referring to the same taxon.

DISTRIBUTION: Tropical America, but early introduced to Asia and now widely naturalized in many other parts of the tropics. About 30 Fijian collections have been examined.

LOCAL NAMES AND USE: The *indigo* or *indigo plant* is one of the sources of commercial indigo, providing a permanent dye of widespread use. The earliest Fijian collection was that of Seemann, who noted the species as common along the coasts of various islands. It was presumably introduced into Fiji by European settlers considerably earlier than 1860.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Lautoka, *Greenwood 393*; Ndreketi Inlet, south of Lautoka, *DA 11760*; Nandi, *DA 9682*; Tavua, *Greenwood 393B*. NANDRONGA & NAVOSA: Navula Creek, upper Singatoka Valley, *DA 11323*; near Singatoka, *Vaughan 3202*. SERUA: Namboutini, *DA*, Jan. 17, 1962 (*Bola 104*); hills west of Waivunu Creek, between Ngaloa and Korovou, *Smith 9462*. RA: Penang, *Greenwood 393A*. TAILEVU: Viwa Island, *Seemann 106*. VANUA LEVU: MATHUATA: Lambasa, *Greenwood 393D*. LAKEMBA: *Tothill 102*; near Tumbou, *Garnock-Jones 903*.

3. *Indigofera tinctoria* L. Sp. Pl. 751. 1753; Merr. Interpret. Rumph. Herb. Amb. 264. 1917; A. C. Sm. in Sargentia **1**: 39. 1942; Greenwood in J. Arnold Arb. **25**: 398. 1944; Yuncker in Bishop Mus. Bull. **220**: 139. 1959; J. B. Gillett in Fl. Trop. E. Afr. Leg. Papil. 308. fig. 42 (2). 1971; Verdcourt, Man. New Guinea Leg. 355. fig. 80 (*G*). 1979.

As noted in Fiji, *Indigofera tinctoria* is a shrub 0.5–1 m. high, infrequently naturalized along roadsides and on dry river banks. It has pink petals and has been seen in flower and fruit in June and December.

TYPIIFICATION: Linnaeus based his species primarily on *Hermann*, vol. 3, fol. 20 (BM HOLOTYPE), from Ceylon.

DISTRIBUTION: Africa and Madagascar to Arabia, southeastern Asia, and Malesia, but now widespread in other areas in cultivation or naturalized. Our material falls into var. *tinctoria*.

LOCAL NAME AND USE: The *Ceylon indigo plant*, like the preceding species, is an important source of commercial indigo.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Lautoka, *Degener & Ordonez 13626*; shores of Mba River near its mouth, *Smith 4739*.

Indigofera tinctoria seems to be very infrequent in Fiji, perhaps having been a comparatively recent and inadvertent introduction that is only sporadically established as a weed. In fruit it is readily separable from the more common *I. suffruticosa*, but without fruits the two species can be confused. The leaflet blades of *I. tinctoria* are proportionately slightly the broader, usually distinctly obovate rather than elliptic to narrowly obovate, and with a broader, more rounded apex; the leaflets of both species, however, have a distinct apical mucro.

4. *Indigofera hirsuta* L. Sp. Pl. 751. 1753; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 156. 1970; J. B. Gillett in Fl. Trop. E. Afr. Leg. Papil. 310. *fig. 45 (1-14)*. 1971; J. W. Parham, Pl. Fiji Isl. ed. 2. 113. 1972; Verdcourt, Man. New Guinea Leg. 351. *fig. 80 (B)*. 1979.

As seen in Fiji, *Indigofera hirsuta* is a shrub to 1 m. high, cultivated only in nursery plots near sea level. Flowers, with brick-red to rose-colored petals, and fruits have been collected in September and October.

TIPIFICATION: The primary basis of the species is *Hermann 172* (BM HOLOTYPE), from Ceylon.

DISTRIBUTION: Africa and Madagascar to southern Asia and eastward to northern Australia, now widely introduced and naturalized elsewhere.

USE: Introduced for trial as a cover crop or for pasture improvement, probably in the 1940's, but not yet established, perhaps because of suspicion that it may be poisonous to stock.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Plant Introduction and Quarantine Station, Nanduruloulu, DA, Oct. 29, 1951, DA 9562, 9669 (FDA 13250).

5. *Indigofera spicata* Forssk. Fl. Aegypt.-Arab. 138. 1775; J. W. Parham, Pl. Fiji Isl. 74. 1964, ed. 2. 113. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 156. 1970; J. B. Gillett in Fl. Trop. E. Afr. Leg. Papil. 317. *fig. 46 (17)*. 1971; Verdcourt, Man. New Guinea Leg. 353. *fig. 80 (E)*. 1979.

Indigofera hendecaphylla Jacq. Collect. 2: 358. 1789; Payne & Naidu in Agr. J. Dept. Agr. Fiji **26**: 1, as *I. endecaphylla*. 1955.

A spreading or prostrate annual herb, with stems sometimes ascending to 60 cm., cultivated near sea level in an introduction garden (but probably not now to be found in Fiji, as noted below).

TIPIFICATION AND NOMENCLATURE: The type of *Indigofera spicata* is *Forskål* (C HOLOTYPE), from Bolgose, Yemen; that of *I. hendecaphylla* was a plant cultivated at Vienna, probably originally from western Africa, the collector unknown. The two concepts are combined by students of the genus.

DISTRIBUTION: Africa and Madagascar to Yemen and southeastern Asia eastward to Malaysia and Australia, now widely cultivated and naturalized elsewhere.

LOCAL NAME AND USES: *Creeping indigo*; although *Indigofera spicata* was introduced for trial prior to 1955 and subsequently established as a pasture legume in Fiji, it is reported to cause photosensitization of cattle, and consequently its use was discouraged and the experimental plants were destroyed. On Niue, where it is also grown, it is considered of value in enriching the soil and helping to prevent erosion.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Plant Introduction and Quarantine Station, Nanduruloulu, DA 7555.

18. *CYAMOPSIS* DC. Prodr. 2: 215. 1825; Hutchinson, Gen. Fl. Pl. 1: 400. 1964; J. B. Gillett in Fl. Trop. E. Afr. Leg. Papil. 328. 1971.

Erect herbs, the indument composed of biramous hairs, the stipules small, setaceous; leaves imparipinnate, 3-7 (rarely 1)-foliolate, estipellate, the leaflets opposite, with dentate or entire blades; inflorescences axillary, racemose, the flowers borne singly in axils of caducous bracts, the bracteoles none; calyx cupuliform, oblique, the lowermost tooth the longest; petals 5, strongly veined, the standard obovate, not clawed, the wings oblong, free from keel, the keel petals erect, slightly gibbous or short-calcarate laterally; stamens 10, the filaments all connate into a closed tube or the vexillary one only lightly attached to tube, the anthers uniform, apiculate; ovary sessile, the ovules numerous, the style short, apically incurved, the stigma capitate; fruits flat or subtetragonous-compressed, longitudinally ridged, rostrate, septate between seeds, dehiscent, the seeds several, compressed.

TYPE SPECIES: *Cyamopsis psoraloides* DC., nom. illeg. = *Cyamopsis tetragonoloba* (L.) Taub. (*Psoralea tetragonoloba* L.).

DISTRIBUTION: Africa to Arabia and eastern India, with three species, one of which is cultivated in Fiji.

1. *Cyamopsis tetragonoloba* (L.) Taub. in Engl. & Prantl, Nat. Pflanzenfam. III. 3: 259. 1894; Purseglove, Trop. Crops, Dicot. 255. 1968; Smartt, Trop. Pulses, 50. 1976.

Psoralea tetragonoloba L. Mant. Pl. 104. 1767.

Cyamopsis psoraloides DC. Prodr. 2: 216, nom. illeg. 1825; J. W. Parham, Pl. Fiji Isl. 72. 1964, ed. 2. 110. 1972.

A robust, bushy annual 1-3 m. high, occasionally cultivated in Fiji near sea level. The branches are stiff, erect, angled, grooved, and white-pilose, and the leaves are 3-foliolate, with ovate, sparsely serrate leaflet blades. The small flowers have the standard white and the wings pinkish. The fruit is linear and compressed, 4-10 cm. long, with a double ridge on the dorsal side and a single ridge on the ventral side, with 5-12 white to gray or blackish seeds.

TYPIIFICATION AND NOMENCLATURE: *Psoralea tetragonoloba* was based on material obtained by Forsskål in Arabia; *Cyamopsis psoraloides* was described from material from India but is illegitimate because *P. tetragonoloba* was listed as a synonym.

DISTRIBUTION: The species is not known in a wild state but is probably indigenous in India. It is now widely introduced into the drier tropics and warm temperate areas as a fodder and green manure.

LOCAL NAMES AND USES: The *cluster bean* or *guar* produces young pods that are edible as a vegetable, and the seeds can be used as cattle feed. The seeds are also made into flour that is used as a thickener in food products and also in textile sizing.

Although no herbarium vouchers from Fiji are available, the species is known to be cultivated there, probably along the lee coasts of the two large islands.

19. *DENDROLOBIUM* Benth. in Miq. Pl. Junghuhn. 215. 1852; Hutchinson, Gen. Fl. Pl. 1: 483. 1964; Ohashi in Ginkgoana 1: 50. 1973.

Desmodium subgen. *Dendrolobium* Wight & Arn. Prodr. Fl. Ind. Orient. 223. 1834.

Trees or shrubs, the stipules striate, fugacious; leaves trifoliate (very rarely unifoliate), stipellate, the leaflet blades chartaceous to coriaceous, the terminal one the largest; inflorescences axillary, subumbellate to congested-racemose, short-

pedunculate, the flowers solitary in axils of bracts, the bracts scarious, caducous, the bracteoles 2 at base of calyx, conspicuous in bud but soon deciduous; calyx campanulate to tubular, deeply 4-lobed, the upper lobe entire or minutely bifid; petals 5, clawed, the standard obovate to orbicular, not auriculate, the wings oblong, the keel petals straight, obtuse; stamens 10, the filaments joined in a sheath beyond middle, the vexillary filament sometimes free in upper half; ovary sessile, the ovules (1-) 2-8, the style conspicuously long, slender, deflexed, the stigma capitate; fruit subfalcate, indehiscent, with 1-8 articles, these at length separating but not dehiscing, the pericarp becoming thick-corky or coriaceous, the seeds oblong-elliptic to reniform, conspicuously rim-arillate.

TYPE SPECIES: Although ING (1979) states that the type species is "non designatus," both Hutchinson and Ohashi, cited above, indicate it as *Dendrolobium umbellatum* (L.) Benth.; "lectotype species" would be more appropriate.

DISTRIBUTION: Paleotropical, with about twelve species, one of which is indigenous in Fiji.

USEFUL TREATMENT OF GENUS: OHASHI, H. 1973 (listed under *Desmodium*).

The genera *Dendrolobium* and *Codariocalyx* have been incorporated in *Desmodium* by most authors, but in keeping with the review of the tribe Desmodieae by Ohashi, Polhill, and Schubert (in Adv. Leg. Syst. 292-300. 1981) they are here retained as distinct.

1. *Dendrolobium umbellatum* (L.) Benth. in Miq. Pl. Junghuhn. 216, 218. 1852; A. Gray, Bot. U. S. Expl. Exped. 1: 431. 1854; Seem. in Bonplandia 9: 255. 1861; Ohashi in Ginkgoana 1: 82. fig. 11 (11), 13 (4, 5), 15 (11), 16 (13), 17 (13); pl. 9, b. 1973. FIGURE 39.

Hedysarum umbellatum L. Sp. Pl. 747. 1753.

Hedysarum australe Willd. Sp. Pl. 3: 1183. 1802.

Desmodium umbellatum DC. Prodr. 2: 325. 1825; Seem. Viti, 435. 1862, Fl. Vit. 56. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 149. 1890; Guillaumin in J. Arnold Arb. 12: 244. 1931; Christophersen in Bishop Mus. Bull. 128: 101. 1935; Yuncker in op. cit. 220: 141. 1959; van Meeuwen in Reinwardtia 6: 263. 1962; J. W. Parham, Pl. Fiji Isl. 73. 1964, ed. 2. 112. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 152. fig. 14. 1970; Schubert in Fl. Trop. E. Afr. Leg. Papil. 455. fig. 65 (4). 1971; St. John & A. C. Sm. in Pacific Sci. 25: 328. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 53, 57. 1972; Verdcourt, Man, New Guinea Leg. 410. 1979.

Desmodium australe DC. Prodr. 2: 326. 1825; Seem. Viti, 435. 1862.

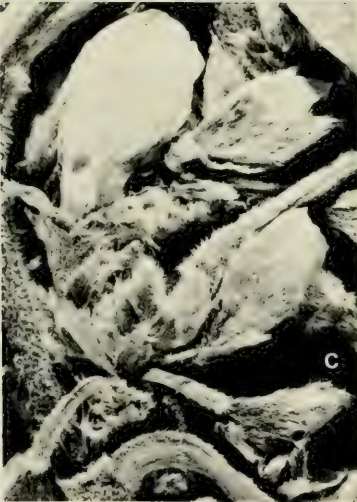
Desmodium umbellatum var. *villosum* Benth. in London J. Bot. 2: 217, nom. nud. 1843.

Dendrolobium australe Benth. in Miq. Pl. Junghuhn. 216, 218. 1852; A. Gray, Bot. U. S. Expl. Exped. 1: 431. 1854.

As seen in Fiji, *Dendrolobium umbellatum* is a shrub or small tree 1-7 m. high at elevations from near sea level to 200 m., often locally common in beach thickets, on rocky coasts, on the inner edges of mangrove swamps, and along rivers, sometimes occurring inland in dry forest or on its edges. Its terminal leaflet blades are elliptic to ovate or obovate, usually 5-14 × 3-7.5 cm. and with 7-12 conspicuous lateral nerves per side, the lateral leaf blades being obliquely elliptic and conspicuously smaller than the terminal one. The inflorescences are densely 10-20-flowered, the petals are white to pale yellow and 8-13 mm. long, the filaments are white, and the style is greenish. The fruits turn from green to brown and at maturity are usually glabrate, 3-5-jointed, and up to 5 cm. × 7 mm.; the seeds are reddish brown to black and about 4 × 3 mm.

TYPIFICATION AND NOMENCLATURE: The type of *Hedysarum umbellatum* is *Her-*

FIGURE 39. *Dendrolobium umbellatum*; A, distal portion of branchlet, with foliage and infructescences, × 1/3; B, mature fruits, × 2; C, an axillary inflorescence, some bracteoles still persisting below calyces, × 6; D, flower with one wing petal bent downward, showing androecium and the style deflexed toward standard, the bracteoles fallen, × 6. A & B from *Smith 1073*, C from *Smith 8064*, D from *Gillespie 4502*.



mann (BM HOLOTYPE in Herb. Hermann), from Ceylon; that of *H. australe* was cited by Willdenow as "Tanna et Nova Caledonia (v. s.)," doubtless a reference to the J. R. & G. Forster collection cited by the latter as *H. umbellatum* in Fl. Ins. Austr. Prodr. 51. 1786. The nomen nudum *Desmodium umbellatum* var. *villosum* was used by Bentham on *Hinds* (K) and *Barclay* (3438, BM), collected in 1840 on Nukulau Island, Rewa Province, Viti Levu. Many other names (cf. Ohashi, 1973, cited above) are referable to *Dendrobium umbellatum* f. *umbellatum*, one of the two forms recognized by Ohashi.

DISTRIBUTION: Eastern Africa and Madagascar to tropical Asia north to the Ryukyu Islands, and eastward through Malesia to northern Australia and into the Pacific to Micronesia, Tonga, Niue, and Samoa. About 60 Fijian collections have been examined.

LOCAL NAMES AND USE: Recorded Fijian names for this frequent species are *sausautave*, *sauthava*, *seuseutavei*, *tokaimbembe*, *roro ni mbembe*, *ai vaka mbula ni namu*, *mothemothe*, and *ndrala*. In the Yasawas the species is said to be used for scaly skin and leprosy.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Wailevu Creek, *St. John* 18086. MAMANUTHAS: NGGALITO Island, Malolo Group, *O. & I. Degener* 32237. VITI LEVU: MBA: Vicinity of Nandi, *DA* 10708. NANDRONGA & NAVOSA: Thuvu, *Webster & Hildreth* 14305. SERUA: Flat coastal strip in vicinity of Ngaloa, *Smith* 9697. RA: Yanggara, *Greenwood* 135B. NAITASIRI: Waindrandra Creek, *DA* 904. TAILEVU: Naingani Island, *DA* 3331; near Londoni, *DA* 14419; Viwa Island, *Seemann* 109, p. p. REWA: Queen's Road west of Suva, *Vaughan* 3322; Nukulau Island, *U. S. Expl. Exped.* KANDAVU: Namalata isthmus region, *Smith* 175. OVALAU: *U. S. Expl. Exped.*; vicinity of Thawathi, *Smith* 8064; north of Levuka, *Gillespie* 4502. MAKONDONGA: *Degener & Ordenez* 13802. WAKAYA: *Milne* 392. KORO: Rocky west coast, *Smith* 1073. NGAU: *Milne* 227. VANUA LEVU: MATHUATA: Seangangga Plateau, in drainage of Korovuli River, vicinity of Natua, *Smith* 6704; Lambasa, *Greenwood* 135C. TAVEUNI: *Seemann* 109, p. p. TOTUYA: *Bryan* 351. VANUA MBALAVU: Near Ndakuilomaloma Village, *Garnock-Jones* 1129. FULANGA: On limestone formation, *Smith* 1189.

20. *DESMODIUM* Desv. in J. Bot. Agric. 1: 122. 1813; Seem. Fl. Vit. 55. 1865; van Meeuwen in Reinwardtia 6: 240. 1962; Hutchinson, Gen. Fl. Pl. 1: 481. 1964; Schubert in Fl. Trop. E. Afr. Leg. Papil. 451. 1971; Ohashi in Ginkgoana 1: 87. 1973; Verdcourt, Man. New Guinea Leg. 385. 1979. Nom. cons.

Herbs or shrubs, sometimes prostrate or scrambling, rarely arborescent, the indument of various parts composed of straight or uncinuate hairs, the stipules striate, often scarious, free or rarely fused at least when young; leaves usually pinnately 3-foliolate, sometimes 1-foliolate, very rarely 5-foliolate, stipellate; inflorescences terminal or axillary, racemose or racemose-paniculate, rarely subumbellate, the primary bracts striate, persistent or caducous, each subtending a fascicle of 2-several flowers or infrequently a single flower; secondary flower-subtending bracts often present; bracteoles lacking or minute and borne at base of calyx; calyx campanulate, the limb 2-lipped or subequally 5-lobed, the 2 upper lobes completely or partially connate, the 3 lower ones acute to subulate-acuminate, the lowermost usually the longest; petals 5, exceeding calyx, the standard obovate to orbicular, not appendaged, often short-clawed, the wings more or less adherent to keel at least when young, short-clawed, the keel petals long-clawed, partially fused above; stamens 10, the filaments connate into a sheath, the vexillary filament often free to middle or to base, the anthers uniform; ovary sessile or stipitate, narrowly oblong, the ovules (2-) many, the style slender, inflexed or incurved, the stigma terminal, minute or capitate; fruit exerted from calyx, compressed, articulated, the articles usually flat, membranaceous or coriaceous, often reticulate-nerved, at length separating from each other, indehiscent or rarely dehiscent on lower suture, the seeds compressed, ellipsoid to subquadrate, often rim-arillate around the hilum.

TYPE SPECIES: *Desmodium scorpiurus* (Sw.) Desv. (*Hedysarum scorpiurus* Sw.).
Typ. cons.

DISTRIBUTION: Pantropical and temperate, with centers of greatest diversity in Mexico, Brazil, and eastern Asia, and with 300 or more species. The precise eastern limit of the Asian-Malesian part of the range is uncertain, but the species occurring in Fiji and eastward all appear to be adventive or cultivated and often naturalized. Nine species are here recorded from Fiji, but it is likely that a few others have been introduced in experimental plots and are not yet established. *Desmodium heterocarpon* var. *strigosum* was in Fiji (and eastward at least to the Societies) prior to 1840 and perhaps as early as 1769 (cf. Merrill in Chron. Bot. 14: 219. 1954), presumably as an adventive or an inadvertent aboriginal introduction. *Desmodium scorpiurus* seems to have been in Fiji, presumably as an adventive, in the 1870's, if the Horne specimen here listed is correctly placed. *Desmodium triflorum* and *D. heterophyllum* may have been introduced into Fiji about 1920 or slightly earlier; the remaining species would appear to be more recent introductions.

USES: Many species of *Desmodium* are utilized for pasture improvement and are useful fodder plants, and some are used as cover crops and green manure. These data, applicable to all our species, are not repeated below.

USEFUL TREATMENTS OF GENUS: KNAAP-VAN MEEUWEN, M. S. Preliminary revisions of some genera of Malaysian Papilionaceae V—A census of the genus *Desmodium*. Reinwardtia 6: 239-276. 1962. OHASHI, H. The Asiatic species of *Desmodium* and its allied genera (Leguminosae). Ginkgoana 1: 1-318. 1973.

KEY TO SPECIES

Leaves all unifoliolate, the blades elliptic to ovate, (1.3-) 4-17 × (1-) 2-6 cm.; stems distally angular, with appressed, gray or whitish hairs; inflorescences terminal and axillary, racemose or panicle, 6-30 cm. long, the flowers 2-4-fasciculate, the primary bracts linear to subulate, not more than 1 mm. broad, the secondary bracts to 3.5 × 0.7 mm.; pedicels 2-6 mm. long, spreading or reflexed in fruit, the fruits appressed to each other, with minute uncinuate hairs, deeply undulate on lower suture, with usually 6-8 articles 2.5-3.5 × 2-2.5 mm., the isthmi narrow, about 0.5 mm. broad. 1. *D. gangeticum*
Leaves trifoliolate (rarely mixed with unifoliolate ones).

Stipules asymmetrical, distinctly auriculate at base on side away from petiole (and less obviously on side toward petiole), acuminate from a broad base, sometimes reflexed, persistent; indument of stems composed of uncinuate hairs; leaflet blades elliptic to ovate.

Fruits narrow, the articles oblong-elliptic, 4-6 × 1-2.5 mm., the isthmi about half as broad as articles; leaflet blades appressed-pilose with dense, fine hairs, and also with some scattered, stiffer hairs and a few uncinuate hairs also on nerves, the terminal leaflet blades 1-5 × 0.5-3 cm.; pedicels 3-7 mm. long, with uncinuate hairs sometimes intermixed with straight hairs. 2. *D. scorpiurus*

Fruits broader, moniliform, the articles suborbicular, 3-6.5 × 3-4 mm., the isthmi comparatively narrow, about 1/4 as broad as articles; leaflet blades laxly pilose with long hairs and/or short, uncinuate hairs, the terminal leaflet blades 2.5-13 × 1.5-7 cm.; pedicels 5-17 mm. long, with many basally thickened hairs. 3. *D. tortuosum*

Stipules symmetrical at base (or at least scarcely auriculate), sometimes caducous.

Inflorescences composed of terminal and axillary racemes 6-20 cm. long, the rachises densely uncinuate-puberulent, the pedicels 4-10 mm. long; flowers usually solitary (sometimes paired or with a third flower not always developing to maturity), each pedicel (or fascicle) subtended by 1 primary bract and 2 lateral secondary bracts, these all long-persistent, the primary bracts lanceolate-acuminate, 2.2-4.5 × 0.5-0.8 mm.; stipules connate for about the lower 1/3-1/2 or at least marginally contiguous when young, 3-11 × 1.5-3 mm., long-persistent, when deciduous leaving the stipular scar continuous on side of stem opposite petiole; leaflet blades appressed-pubescent beneath, the terminal leaflet blades 2-9 × 1.5-4.5 cm.; fruits more or less pendulous, distinctly incised on lower margin, the articles 3.5-5 × 2-3.5 mm., the isthmi about 1/3 as broad as articles. 4. *D. incanum*

Inflorescences with flowers 2 or 3 (-5) in fascicles (occasionally solitary), each fascicle subtended by a soon caducous primary bract, these ovate-acuminate, 3-6 (-8) × 1.2-2.5 (-4) mm., the lateral secondary bracts absent (very rarely present and depauperate); stipules not connate or marginally contiguous, when deciduous leaving the stipular scar incomplete on side of stem opposite petiole.

Upper calyx lobes usually connate entirely or nearly to apex, the calyx appearing 4-lobed; inflorescences racemose, many-flowered, 2-20 cm. long; primary bracts congested in young inflorescences and entirely covering flower buds, hence the youngest parts of inflorescences strobiliform; fruits 10-28 mm. long, uncinately-puberulent throughout or at least on sutures; leaflet blades usually longer than broad, (0.5-) 1-7 × (0.4-) 0.7-3.3 cm.; plants creeping or ascending herbs or procumbent or suffruticose, the rootstocks and stems somewhat woody.

Fruits incised on lower sutures, the articles elliptic, distinctly longer than broad, 3.5-7 × 2.5-3 mm., the isthmi about half as broad as articles; inflorescences composed of terminal and axillary, loosely flowered racemes on suberect branches arising from creeping stems or woody rootstocks; pedicels 7-17 (-21) mm. long, arching upward to horizontal, stiff-pilose and finely puberulent with multicellular and uncinately hairs (like rachis and distal parts of branchlets).

5. *D. ascendens*

Fruits slightly undulate on lower sutures, the articles semicircular to oblong, 2.5-4.5 × 2.5-3 mm., the isthmi at least 2/3 as broad as articles; inflorescences composed of terminal and axillary densely flowered racemes; pedicels (2-) 3-5 (-8) mm. long, almost erect, the rachis and distal parts of branchlets in our variety densely appressed-strigose with straight hairs.

6. *D. heterocarpon*

Upper calyx lobes shallowly connate at base for less than half their length, the calyx appearing subequally 5-lobed; inflorescences laxly and comparatively few-flowered, fasciculate or racemose, not more than 6 cm. long; primary bracts in young inflorescences not congested, hence the young parts of inflorescences not strobiliform; fruits (5-) 6-20 (-22) mm. long, indented on lower suture, the articles oblong or quadrate, with strongly reticulate nerves; leaflet blades often suborbicular, 0.3-2.5 (-3.5) × 0.3-1.4 (-2) cm.; plants herbaceous or subshrubby, procumbent, freely branched, the rootstocks woody.

Leaflet blades obovate, usually distinctly (but slightly) emarginate, the terminal leaflet blades 0.3-1 (-1.2) cm. long and broad; stems with appressed or weakly spreading hairs up to 1 mm. long; inflorescences fasciculate, 2-5-flowered, the pedicels 3-8 (-13) mm. long, with straight or weakly spreading hairs 0.7-1 mm. long or glabrous; fruits composed of 2-5 articles, these 2-4 mm. long and broad, not dehiscent, with only uncinately hairs, the isthmi 2/3-3/4 as broad as articles. 7. *D. triflorum*

Leaflet blades usually broadly elliptic, not or only faintly emarginate, the terminal leaflet blades (0.3-) 1-2.5 × (0.3-) 0.8-1.4 (-2) cm.; stems with long spreading hairs to 2 mm. long; inflorescences sometimes few-flowered and fasciculate and sometimes short-racemose, the pedicels or peduncles 10-30 mm. long, glabrous or with a few minute uncinately hairs distally; fruits composed of (2-) 4-6 articles, these 3-4 mm. long and broad, ultimately dehiscent along lower suture, with both uncinately and a few scattered straight hairs, the isthmi about 4/5 as broad as articles. 8. *D. heterophyllum*

1. *Desmodium gangeticum* (L.) DC. Prodr. 2: 327. 1825; A. C. Sm. in J. Arnold Arb. 31: 171. 1950; van Meeuwen in Reinwardtia 6: 249. 1962; J. W. Parham, Pl. Fiji Isl. 73. 1964, ed. 2. 111. 1972; Schubert in Fl. Trop. E. Afr. Leg. Papil. 467. fig. 65 (10). 1971; Ohashi in Ginkgoana 1: 184. pl. 22, b. 1973; Verdcourt, Man. New Guinea Leg. 397. fig. 93 (E). 1979.

Hedysarum gangeticum L. Sp. Pl. 746. 1753.

As seen in Fiji, *Desmodium gangeticum* is a coarse herb to 70 cm. high, somewhat woody near base, sparingly naturalized in grassland near sea level. The petals vary from purple to bluish or white; flowers and fruits have been noted in April and May.

TIPIFICATION: Linnaeus cited three Indian references for *Hedysarum gangeticum*; Schubert (1971, cited above) indicated the HOLOTYPE as Herb. Linnaeus 921.13 (LINN).

DISTRIBUTION: Throughout the Old World tropics, now also introduced into Pacific areas as far east as the Societies and also into America. Curiously, in Fiji it seems limited to the island of Kandavu.

AVAILABLE COLLECTIONS: KANDAVU: Vunisea, DA 2999, 3000. KANDAVU without further locality, DA, May, 1931, DA 2 (coll. C. R. Turbet, May, 1931).

2. *Desmodium scorpiurus* (Sw.) Desv. in J. Bot. Agric. 1: 122. 1813; van Meeuwen in Reinwardtia 6: 101. 1961, in op. cit. 6: 258. 1962; J. W. Parham, Pl. Fiji Isl. ed. 2. 112. 1972; Verdcourt, Man. New Guinea Leg. 407. fig. 94 (G). 1979.

Hedysarum scorpiurus Sw. Nov. Gen. & Sp. Prodr. 107. 1788.

Meibomia scorpiurus Kuntze, Rev. Gen. Pl. 1: 198. 1891; Greenwood in Proc. Linn. Soc. 154: 93, as *M. scorpiuroides*. 1943.

A prostrate or sprawling herb, occasionally naturalized along roadsides near sea level. The petals are pink to pale purple; the comparatively long, symmetrical articles of the fruit readily characterize the species, which has been observed in flower and fruit in May, July, and September.

TYPIFICATION: Swartz cited "Hispaniola, Jamaica," the latter island perhaps represented by a Browne collection.

DISTRIBUTION: West Indies and Mexico southward to Peru, now introduced into and adventive in many other areas.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mba closed area, DA 14354. REWA: Suva and vicinity, Tothill 108, DA 35 (C. R. Turbet, Nov., 1923), 3075, 4049, 5819, 5820, L.11427. OVALAU: Vuma, north of Levuka, DA 17039. FIJI without further locality, Horne 738.

3. *Desmodium tortuosum* (Sw.) DC. Prodr. 2: 332. 1825; van Meeuwen in Reinwardtia 6: 101. 1961, in op. cit. 6: 260. 1962; Schubert in Fl. Trop. E. Afr. Leg. Papil. 474. 1971; Verdcourt, Man. New Guinea Leg. 408. 1979.

Hedysarum purpureum Mill. Gard. Dict. ed. 8. 1768.

Hedysarum tortuosum Sw. Nov. Gen. & Sp. Prodr. 107. 1788.

Desmodium purpureum Fawc. & Rendle, Fl. Jam. 4: 36. 1920; A. C. Sm. in J. Arnold Arb. 31: 171. 1950; J. W. Parham, Pl. Fiji Isl. 73. 1964, ed. 2. 112. 1972; non Hook. & Arn. (1832).

A shrub or ligneous herb to about 2 m. high, cultivated and presumably adventive near sea level, with white to pink petals shading to mauve. Flowers and fruits have been obtained in scattered months.

TYPIFICATION AND NOMENCLATURE: The type of *Hedysarum purpureum* is *Houstoun* (BM HOLOTYPE), collected in Vera Cruz, Mexico, in 1730; the epithet, however, was not available when it was transferred to *Desmodium* in 1920. The type of *H. tortuosum* is Swartz (S HOLOTYPE; ISOTYPE at B in Herb. Willdenow 13808), from Jamaica. (Data from Schubert, 1971, cited above.)

DISTRIBUTION: Throughout tropical and subtropical America, now introduced and naturalized in the Old World tropics.

LOCAL NAMES: The usual name in the southeastern U. S. A., now widely used elsewhere, is *Florida beggar weed*; *Spanish clover* is also recorded from Fiji.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mba closed area, DA 14352, 14355. NANDRONGA & NAVOSA: Agricultural Station, Natholelevu, Singatoka, DA 12580. RA: Yanggara, DA 12312. NAITASIRI: Central Agricultural Station, Navuso, DA 2273, 2411, 5519. TAVEUNI: Mua Plantation, DA 11513. FIJI without further locality, DA 5616.

4. *Desmodium incanum* DC. Prodr. 2: 332. 1825; Nicolson in Taxon 27: 370. 1978.

Hedysarum racemosum Aubl. Hist. Pl. Guiane Fr. 774. 1775; non *Desmodium racemosum* DC. (1825).

Hedysarum incanum Sw. Nov. Gen. & Sp. Prodr. 107, nom. illeg. 1788; non Thunb. (1784).

Hedysarum canum J. F. Gmelin, Syst. Nat. 1124, nom. illeg. 1792.

Desmodium canum Schinz & Thell. in Mém. Soc. Sci. Nat. Neuchâtel 5: 371. 1913; Fosberg in Micro-nesia 2: 144. 1966; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 151. 1970; Schubert in Fl. Trop. E. Afr. Leg. Papil. 456. 1971; J. W. Parham, Pl. Fiji Isl. ed. 2. 111. 1972; Verdcourt, Man. New Guinea Leg. 394. fig. 93 (D). 1979.

A shrub or woody herb 0.5-1 m. high, occasional from near sea level to an elevation of about 300 m., cultivated as pasturage or naturalized in plantations and along roads. The petals vary from blue or red to purple; flowering and fruiting do not appear seasonal.

TYPIFICATION AND NOMENCLATURE: The complicated synonymy of this widespread, weedy species has been clarified by Nicolson (1978, cited above), who considers that *Hedysarum racemosum*, *H. incanum* Sw., and *H. canum* are all typified by Plumier,

Pl. Amer. 140. *pl.* 149, *fig.* 1. 1757 (although Schubert, 1971, cited above, lists *Swartz* (s HOLOTYPE) for *H. incanum* Sw., which in any case is a later homonym). The earliest legitimate name for the taxon is *H. racemosum* Aubl., but the epithet is not available in *Desmodium*. *Desmodium incanum* DC. is based on *Hedysarum incanum* Sw., but since the latter is an illegitimate basionym, de Candolle's binomial may be considered as a legitimate new name with priority from 1825 and to be used without a parenthetical author. Several other names not found in the literature referring to the Fijian Region are discussed by Nicolson.

DISTRIBUTION: America, from Florida and Texas to Uruguay and Argentina, now cultivated and naturalized in many other tropical areas and known in the Pacific eastward to the Marquesas and Hawaii.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Wainavothe, *DA* 7061, 7062. NANDRONGA & NAVOSA: Agricultural Station, Nathotholevu, Singatoka, *DA* 10843. RA: Yanggara, *DA* 12309. NAITASIRE: Plant Introduction and Quarantine Station, Nanduruloulou, *DA* 8483 (*FDA* 13150), 9564, 12965 (*FDA* 15267). VANUA LEVU: THAKAUNDRIVE: Maravu Estate, *DA* 8831; Nathavanandi, *DA* 10773; Nangingi, *DA* 10780.

5. *Desmodium adscendens* (Sw.) DC. Prodr. 2: 332. 1825; van Meeuwen in Reinwardtia 6: 245. 1962; J. W. Parham, Pl. Fiji Isl. vi. 1964, ed. 2. 111. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 150. 1970; Schubert in Fl. Trop. E. Afr. Leg. Papil. 461. 1971; Ohashi in Ginkgoana 1: 199. *fig.* 61 (1), 62 (2); *pl.* 25, b. 1973; Verdcourt, Man. New Guinea Leg. 392. *fig.* 93 (A). 1979.

Hedysarum adscendens Sw. Nov. Gen. & Sp. Prodr. 106. 1788.

Desmodium uncinatum sensu J. W. Parham, Pl. Fiji Isl. 73. 1964; non DC.

Desmodium trichocaulon sensu J. W. Parham, Pl. Fiji Isl. ed. 2. 112. 1972; non DC.

As seen in Fiji, *Desmodium adscendens* is a low shrub or subligneous herb 0.3–1.3 m. high, the stem sometimes creeping and sometimes forming tussocks with ascending branches. It is now locally common and naturalized in pastures, fields, and waste places, sometimes being found on open hillsides and along forest trails up to an elevation of about 500 m. Its petals are pink to blue or pale purple, and flowers and fruits occur throughout the year.

TIPIFICATION AND NOMENCLATURE: The type is *Swartz* (s HOLOTYPE), collected in Jamaica. In the present treatment I include those specimens that have passed in Fiji as *Desmodium trichocaulon* (a nomenclatural synonym of *D. heterocarpon* var. *heterocarpon*), although they differ from typical material of *D. adscendens* in having smaller leaflets and a more compact habit, with woody branches arising directly from a large rootstock.

DISTRIBUTION: Widespread throughout the tropics of both hemispheres, but presumably originally a native of America. About 40 Fijian collections are available.

LOCAL NAMES: *Tropical clover* and *kandakanda* have been recorded.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mba closed area, *DA* 13192. NANDRONGA & NAVOSA: Vicinity of Mbalo, near Vatukarasa, *Degener* 15295. SERUA: Vicinity of Navva, *DA* 10098. NAMOSI: Lower slopes of Mt. Voma, *DA* 1749. NAITASIRE: Plant Introduction and Quarantine Station, Nanduruloulou, *DA* 9565. TAILEVU: Vicinity of Korovou, *DA* 14038. REWA: Suva, *DA* 5821. KANDAVU: Hills above Ndinggele, *DA* 2990. OVALAU: Wainiloka, *DA* 1348. YANUTHA (one of the Yanutha Islands south of Ovalau): *DA* 9630. VANUA LEVU: MATHUATA: Seangangga District Farm, *DA* 14319; vicinity of Lambasa, *Harwood* 57. THAKAUNDRIVE: Nakarambo, Vaturova Tikina, *DA*, July 2, 1947. YATHATA: Naveranavula, *DA* 15547. LAKEMBA: Near Tumbou, *Garnock-Jones* 899.

6. *Desmodium heterocarpon* (L.) DC. Prodr. 2: 337, as *D. heterocarpum*. 1825; van Meeuwen in Reinwardtia 6: 93. 1961, in op. cit. 6: 251. 1962; Fosberg in Micronesica 2: 145. 1966; Schubert in Fl. Trop. E. Afr. Leg. Papil. 462. 1971; Ohashi in Ginkgoana 1: 210. 1973; Verdcourt, Man. New Guinea Leg. 399. 1979.

Hedysarum heterocarpon L. Sp. Pl. 747. 1753.

TIPIFICATION: The Ceylon specimens in Herb. Hermann 2: 32, 3: 39, and 4: 20 (BM SYNTYPES) are indicated by Schubert (1971, cited above) as typifying the species and its type variety.

The authors cited above discuss *Desmodium heterocarpon* in its broad sense. It is divided into two varieties by van Meeuwen, who in this respect is followed by Fosberg, Schubert, and Verdcourt. Ohashi has recognized two subspecies in the taxon, dividing subsp. *heterocarpon* into four varieties. It appears to me that the Fijian material (and perhaps all the Pacific material) of the species falls into var. *strigosum* (cf. also Fosberg, 1966), although van Meeuwen (1962) included Polynesia (specifically mentioning Tonga) in her distributional concept of var. *heterocarpon*.

6a. ***Desmodium heterocarpon* var. *strigosum*** van Meeuwen in Reinwardtia 6: 95. 1961, in op. cit. 6: 251. 1962; Fosberg in Micronesica 2: 145. 1966; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 151. 1970; Schubert in Fl. Trop. E. Afr. Leg. Papil. 463. fig. 65 (8). 1971; Verdcourt, Man. New Guinea Leg. 399. 1979.

Hedysarum polycarpum Poir. in Lam. Encycl. Méth. Bot. 6: 413. 1804.

Desmodium polycarpum DC. Prodr. 2: 334. 1825; A. Gray, Bot. U. S. Expl. Exped. 1: 432. 1854; Seem. in Bonplandia 9: 255. 1861, Viti, 435. 1862, Fl. Vit. 56. 1865; Engl. in Bot. Jahrb. 7: 458. 1886.

Desmodium heterocarpon sensu Drake, Ill. Fl. Ins. Mar. Pac. 149. 1890; Christophersen in Bishop Mus. Bull. 128: 101. 1935; A. C. Sm. in J. Arnold Arb. 31: 171. 1950; Yuncker in Bishop Mus. Bull. 220: 140. 1959; J. W. Parham, Pl. Fiji Isl. 73. 1964, ed. 2. 111. 1972; non sensu str.

Desmodium heterocarpon var. *strigosum* f. *strigosum*; Fosberg in Micronesica 2: 145. 1966.

Desmodium heterocarpon subsp. *heterocarpon* var. *strigosum* van Meeuwen ex Ohashi in Ginkgoana 1: 215. fig. 61 (7, 7'), 64 (2). 1973.

In Fiji *Desmodium heterocarpon* var. *strigosum* is a coarse herb or shrub 0.6–2 m. high, occurring from near sea level to about 200 m. in pastures and secondary growth, along roadsides, on waste land, and sometimes thoroughly naturalized in dry forest. It has pale blue or purplish flowers and may be seen in flower and fruit in most months.

TIPIFICATION AND NOMENCLATURE: The type of the variety is *Kalkman* (B. W. 3596) (L HOLOTYPE; ISOTYPES AT A, BO, CANB, P), collected in New Guinea. *Hedysarum polycarpum* is typified by a plant from Malesia grown at Paris (P-LA HOLOTYPE).

DISTRIBUTION: Variety *strigosum* appears indigenous from southeastern Asia throughout Malesia to Micronesia and possibly to New Caledonia; eastward in the Pacific as far as the Tuamotus and Hawaii it was presumably an inadvertent aboriginal introduction.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Inland from Lautoka, Greenwood 452. NAITASIRI: Vicinity of Viria, DA 513; Central Agricultural Station, Navuso, DA, Oct. 27, 1942. TAILEVU: Tonia, DA 10005. REWA: Suva Point, B. & H. Parham 35, DA 1052. MBENGGGA: DA 9619. OVALAU: Port Kinnaird, Seemann 111. WAKAYA: Milne 377. KORO: Nasau, DA 11803. NGAU: Milne 150. VANUA LEVU: MATHUATA: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, Smith 6811; Seanggangga region, DA 11779. THAKAUNDOVE: Nathavanandi, DA 13137. TAVEUNI: DA 2564; vicinity of Somosomo, Gillespie 4774. MATUKU: On grass-covered forehills, Bryan 260. FIJI without further locality, U. S. Expl. Exped., Harvey, Horne 114, 835.

7. ***Desmodium triflorum* (L.) DC. Prodr. 2: 334. 1825; Christophersen in Bishop Mus. Bull. 128: 101. 1935; Greenwood in Proc. Linn. Soc. 154: 96. 1943; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 103. 1948; Greenwood in J. Arnold Arb. 30: 76. 1949; Yuncker in Bishop Mus. Bull. 220: 140. 1959; van Meeuwen in Reinwardtia 6: 261. 1962; J. W. Parham, Pl. Fiji Isl. 73. 1964, ed. 2. 112. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 152. 1970; Schubert in Fl. Trop. E. Afr. Leg. Papil. 459. 1971; Ohashi in Ginkgoana 1: 245. fig. 67 (7); pl. 36, b. 1973; Verdcourt, Man. New Guinea Leg. 409. fig. 94 (H). 1979.**

Hedysarum triflorum L. Sp. Pl. 749. 1753.

A diminutive prostrate herb, abundantly naturalized at elevations from near sea level to 600 m. in lawns, waste places, and villages, on grassy hillsides, and along roadsides and forest tracks. The petals are rich pink to blue or purple, and flowers and fruits occur throughout the year.

TYPIFICATION: Schubert (1971, cited above) indicates the lectotype as Herb. Linnaeus 921.45 (LINN), from Ceylon.

DISTRIBUTION: Pantropical, and northward into the southern U. S. A. In much of the Pacific the species was presumably introduced and has become naturalized eastward to the Societies and Hawaii. About 20 Fijian collections are available.

LOCAL NAMES AND USES: In Fiji the names *konikoni*, *vakathengu*, and *tropical trefoil* are used. The species was probably introduced as a green manure and cover crop, but it is also considered to be useful in turf and is common in lawns.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Tavua, *Greenwood 12A*; Nalotawa Village, *Smith 4322*. RA: Yanggara, *DA 11872*; Penang, *Greenwood 12B*. REWA: Suva, *DA 19 (C. R. Turbet)*. VATULELE: *Tothill 107*. OVALAU: Levuka, *DA 1130*. VANUA LEVU: THAKAUNDOVE: Maravu Estate, *DA 8827*. NAITAMBA: *Tothill 106*. VANUA MBALAVU: Near Lomaloma, *Garnock-Jones 1139*. LAKEMBA: Near Tumbou, *Garnock-Jones 900*.

8. *Desmodium heterophyllum* (Willd.) DC. Prodr. 2: 334. 1825; Greenwood in Proc. Linn. Soc. 154: 96. 1943; J. W. Parham in Dept. Agr. Fiji Bull. 35: 94. fig. 47, a-e. 1959; van Meeuwen in Reinwardtia 6: 251. 1962; J. W. Parham, Pl. Fiji Isl. 73. 1964, ed. 2. 111. 1972; Fosberg in Micronesica 2: 146. 1966; Ohashi in Ginkgoana 1: 239. fig. 67 (6). 1973; Verdcourt, Man. New Guinea Leg. 400. fig. 93 (I). 1979.

Hedysarum heterophyllum Willd. Sp. Pl. 3: 1201. 1802.

A prostrate or semiprostrate or sprawling herb or shrub, rarely with suberect branches, occurring at elevations from near sea level to about 1,000 m. and abundantly naturalized in pastures, grassland, plantations, waste places, and villages, and sometimes along forest trails. The petals shade from dark reddish purple to white, and flowers may be found, together with fruits, throughout the year.

TYPIFICATION: Willdenow based his concept on a Burman illustration of a plant from Ceylon.

DISTRIBUTION: Southeastern Asia to Malesia and perhaps to the Mariana Islands, now widely naturalized in the Pacific eastward to Hawaii. Some 50 Fijian collections have been examined; the species is often misidentified as *Desmodium triflorum*, and material should be checked with the superficial similarity of the two species in mind.

LOCAL NAMES: *Senivakathengu*, *wakutu*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Lautoka, *Greenwood 518B*; western slopes of Mt. Nanggaranambuluta, east of Nandarivatu, *Smith 4761*. SERUA: Tokotoko, Navua, *DA 9430*; flat coastal strip in vicinity of Ngaloa, *Smith 9500*. NAITASIRE: Nanduna, *DA 9597*; Koronivia, *DA 6019*; vicinity of Nasinu, *Gillespie 3415*. TALEVU: Hills east of Wainimbuka River, vicinity of Ndukuivuna, *Smith 7222*; Matavatathou, *DA 9963*. REWA: Suva and vicinity, *Bryan 183*, *Degener & Ordenez 13513*. VATULELE: *Tothill 122*. MBENGGGA: *DA 9618*. VANUA LEVU: MBUA: Vicinity of Mbua, *DA 5029*. MATHUATA: Seangangga Plateau, in drainage of Korovuli River, vicinity of Natua, *Smith 6871*; Lambasa, *Greenwood 604*. THAKAUNDOVE: Maravu Estate, *DA 8825*. RAMBI: *DA*, Jan. 21, 1948. TAVEUNI: Nggathavulo Estate, *DA 8884*.

INADEQUATELY KNOWN TAXON

9. *Desmodium discolor* Vogel in Linnaea 12: 103. 1838; J. W. Parham, Pl. Fiji Isl. ed. 2. 111. 1972.

The plant so identified is a large, erect shrub 1-2 m. high, known only from introduction gardens and apparently not established. Its trifoliolate leaves are short-

petiolate, with ovate leaflet blades up to 6.5×3 cm. with ascending nerves and a copious indument beneath of pale spreading hairs. The inflorescences are terminal and narrowly paniculate.

TYPIFICATION: Vogel cited a Sellow collection from southern Brazil.

DISTRIBUTION: Presumably Brazil; cultivated material under this name has been recorded in Hawaii, but in the absence of a modern treatment of the genus in Brazil I am unable to verify the identification.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Plant Introduction and Quarantine Station, Nanduruloulou, DA 8481 (FDA 13249); Mbatiki Nursery, DA, Sept. 30, 1946.

21. *CODARIOCALYX* Hassk. in *Flora* **25**: Beibl. 2: 48. 1842; Hutchinson, *Gen. Fl. Pl.* **1**: 479. 1964; Ohashi in *Ginkgoana* **1**: 40. 1973.

Erect shrubs, the stipules scarious, striate, fugacious; leaves trifoliolate or often unifoliolate, stipellate, the stipels subulate, the terminal leaflet blade large, the lateral leaflet blades smaller or absent; inflorescences terminal and axillary, racemose or paniculate, in bud with conspicuous, overlapping, striate bracts, each subtending 2- or 3-flowered fascicles, caducous, the bracteoles none; calyx broadly campanulate, 4-lobed, the upper lobe bifid; petals 5, much larger than calyx, the standard suborbicular, minutely clawed, not auricled, the wings obovate-semideltooid, short-clawed, the keel petals falcate-obovate, longer than wings, long-clawed, appendaged dorsally at base of lamina; stamens 10, diadelphous, the free parts of filaments alternately longer and shorter, the vexillary filament the shortest, connate to tube only at base, the anthers ellipsoid; ovary linear-cylindric, the ovules 6-13, the style inflexed and distally thickened, the stigma terminal, capitate; fruit narrowly oblong, not articulated, dehiscent along the undulate lower suture, the upper suture thickened, not indented, the articles subquadrate, not separating, the seeds ellipsoid, conspicuously arillate.

TYPE SPECIES: *Codariocalyx gyrans* (L. f.) Hassk. (*Hedysarum gyrans* L. f.) = *Codariocalyx motorius* (Houtt.) Ohashi (*Hedysarum motorium* Houtt.).

DISTRIBUTION: Southeastern Asia throughout Malesia to northern Australia, with two species, one of which is cultivated in Fiji.

USEFUL TREATMENT OF GENUS: OHASHI, H. 1973 (listed under *Desmodium*).

1. *Codariocalyx gyroides* (Roxb. ex Link) Hassk. in *Flora* **25**: Beibl. 2: 49. 1842; Sykes in *New Zealand Dept. Sci. Indust. Res. Bull.* **200**: 147. 1970; J. W. Parham, *Pl. Fiji Isl.* ed. 2. 110. 1972; Ohashi in *Ginkgoana* **1**: 43. *fig. 7 (1), 8 (1)*. 1973.

Hedysarum gyroides Roxb. *Hort. Beng.* 57, nom. nud. 1814; Roxb. ex Link, *Enum. Pl. Hort. Berol.* **2**: 247. 1822.

Desmodium gyroides DC. *Prodr.* **2**: 326. 1825; van Meeuwen in *Reinwardtia* **6**: 250. 1962; J. W. Parham, *Pl. Fiji Isl.* **73**. 1964; Verdcourt, *Man. New Guinea Leg.* **398**. *fig. 93 (G)*. 1979.

An erect, freely branching shrub to 3 m. high, cultivated near sea level and apparently not yet naturalizing. The terminal leaflet blades are elliptic to obovate-oblong, rarely exceeding 7×4 cm., with 5-8 obvious, ascending lateral nerves per side, the lateral leaflet blades being much smaller or entirely lacking. The inflorescences, up to 15 cm. long, bear flowers with pinkish to purplish petals 7-12 mm. long. The fruits, copiously pilose with both straight and uncinuate, yellowish hairs, usually do not exceed $4 \text{ cm.} \times 6 \text{ mm.}$, and the seeds are about $4 \times 2.5 \text{ mm.}$ Our material bore flowers and fruits in June and July, and flowers also in October.

TYPIFICATION: Since the species is based on Roxburgh's name of 1814, the type is probably a specimen collected, as noted by de Candolle in 1825, "in India orient. ad Silhet," presumably Sylhet, Bangladesh.

DISTRIBUTION: Southeastern Asia (from India, Nepal, and southern China) to New Guinea, occasionally cultivated elsewhere.

USES: The species may have been first introduced into Fiji in the 1880's, as J. B. Thurston's *Catalogue* (1886) lists "*Desmodium gyrans*" (i. e. *Codariocalyx gyrans*, probably intending *C. gyroides*). Apparently its intended use was as a shade for young cocoa trees. It is also used as a forage plant and to provide green manure and soil cover. Specimens thus far seen were growing in Government stations.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Plant Introduction and Quarantine Station, Nanduruloulou, DA 9670 (FDA 13672), 10188, 10189 (FDA 14343); Principal Agricultural Station, in cocoa nursery, Koronivia, DA 12133. VANUA LEVU: THAKAUNDROVE: Wainigata Cocoa Station, near Savu-savu, DA 12006.

22. URARIA Desv. in J. Bot. Agric. 1: 122. 1813; van Meeuwen in Reinwardtia 5: 450. 1961; Hutchinson, Gen. Fl. Pl. 1: 481. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Pabil. 479. 1971, Man. New Guinea Leg. 413. 1979.

Shrubs or perennial herbs, the stipules free, persistent; leaves pinnately 3-9-foliolate (sometimes 1-foliolate), stipellate, the leaflet blades with lateral nerves extending to margin; inflorescences usually terminal, spiciform-racemose or panicle, the pedicels usually paired, hamate, the primary bracts persistent or deciduous, the secondary bracts and bracteoles lacking; flowers often twisted, the calyx 5-lobed, the lobes subulate-acuminate, the 2 upper ones the shortest; petals 5, the standard orbicular to obovate, the wings falcate-oblong, adhering to keel, the keel petals slightly incurved, obtuse; stamens 10, the filaments of 9 connate into a tube, the vexillary filament free to base, the anthers uniform; ovary sessile or short-stipitate, the ovules 2-many, the style filiform, inflexed distally, the stigma capitate; fruits subsessile, constricted between seeds, plicate-retrofracted and mostly enclosed in the persistent calyx, the segments 1-7, inflated, 1-seeded, indehiscent, the seeds subglobose or compressed, exarillate.

LECTOTYPE SPECIES: *Uria picta* (Jacq.) Desv. ex DC. (*Hedysarum pictum* Jacq.) (vide Hutchinson, Gen. Fl. Pl. 1: 482. 1964).

DISTRIBUTION: Paleotropical, extending in the Pacific to Fiji and Samoa, with about 20 species, one of which seems indigenous in Fiji.

1. *Uria lagopodioides* (L.) Desv. ex DC. Prodr. 2: 324, as *U. lagopoides*. 1825; emend. Verdcourt, Man. New Guinea Leg. 415. 1979. FIGURE 40A-C.

Hedysarum lagopodioides L. Sp. Pl. 1198. 1753.

Lespedeza lagopodioides Pers. Syn. Pl. 2: 318. 1807.

Uria lagopoides DC. ex A. Gray, Bot. U. S. Expl. Exped. 1: 430. 1854; Seem. Fl. Vit. 57. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 150. 1890.

Uria lagopodioides DC. ex Seem. in Bonplandia 9: 255. 1861, Viti, 435. 1862; Christophersen in Bishop Mus. Bull. 128: 102. 1935; Yuncker in op. cit. 178: 62. 1943, in op. cit. 220: 142. 1959; van Meeuwen in Reinwardtia 5: 451. 1961; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 161. 1970; St. John & A. C. Sm. in Pacific Sci. 25: 329. 1971.

Uria lagopodioides DC. ex J. W. Parham, Pl. Fiji Isl. 77. 1964, ed. 2. 119. 1972; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 53. 1972.

As it occurs in Fiji, *Uria lagopodioides* is a sprawling or suberect herb to 60 cm. high, with a stem somewhat woody at base and with soft, pale hairs and a few uncinat hairs on many parts. It is common on grassy slopes in the dry zone, especially along leeward coasts, and it may be found up to 750 m. elevation as a weed in pastures,

FIGURE 40. A-C, *Uria lagopodioides*; A, distal portions of branchlets, with foliage and maturing inflorescences, $\times 1/2$; B, maturing inflorescence, with persistent primary bracts and projecting calyx lobes, $\times 2$; C, matured flower subtended by a primary bract, showing the 3 longest calyx lobes, a remnant of the filament tube, and 1 segment of a fruit with a terminal scar indicating a caducous second segment, $\times 6$. D, *Christia vespertilionis*; terminal portion of stem, with foliage and an inflorescence, $\times 1/2$. A from DA 11776, B & C from DA 11702, D from Smith 1512.



plantations, villages, and waste places. The leaves are 1- or 3-foliolate, the leaflets ovate to obovate, the terminal one larger than the laterals, 2-8 × 1.5-6 cm. The compact inflorescences seldom exceed 6 cm. in length; the petals are pale reddish purple, turning bluish or nearly white, and the fruits commonly have only 2 (sometimes 1) segments. Flowers and fruits do not appear seasonal.

TIPIFICATION: Linnaeus based his species on material collected in China by Osbeck. The specific epithet has been variously spelled, perhaps correctly for the first time by Persoon in 1807, and correctly in *Uraría* by Verdcourt in 1979.

DISTRIBUTION: Northern India and southern China throughout Malesia to northern Australia, and eastward in the Pacific to Fiji and Samoa, apparently adventive in Tonga, Niue, and elsewhere. Although in Fiji the species is usually noted in weedy habitats, there seems no reason to doubt its indigenoussness. More than 30 Fijian collections are at hand.

LOCAL NAMES: *Lakaníkasa*, *lakanirase*, and *setamoli* have been recorded.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: West of Mbatinaremba, Nakawa Gulch, *St. John 18142*. VITI LEVU: MBA: Hills near Lautoka, *Greenwood 1248*; Tavua, *Greenwood 5C*; vicinity of Nandarivatu, *Gillespie 4322*. NANDRONGA & NAVOSA: Agricultural Station, Nathotholevu, near Singatoka, *DA 11702*. RA: Nananu-i-thake Island, *DA 2782*; Penang, *Greenwood 5B*. TAILEVU: Naingani Island, *DA 3335*. REWA: Vutia Creek, Rewa delta, *DA 2581*. KORO: *DA 3434*. NGAU: *Tothill 115*. VANUA LEVU: MBUA: Nasau, Rukuruku Bay, *H. B. R. Parham 18*. MATHUATA: Kia Island, Ndaku Village, *DA 11776*; Lambasa, *Greenwood 5E*. VANUA LEVU without further locality, *U. S. Expl. Exped., Seemann 108*. YATHATA: *Bryan 593*. VANUA MBALAVU: Vicinity of Lomaloma, *DA 10237*.

23. *CHRISTIA* Moench, *Suppl. Meth. Pl.* 39. 1802; van Meeuwen in *Reinwardtia* 6: 89. 1961; Backer & Bakh. *f. Fl. Java* 1: 612. 1963; Hutchinson, *Gen. Fl. Pl.* 1: 481. 1964; Verdcourt, *Man. New Guinea Leg.* 416. 1979.

Lourea Necker, *Elem. Bot.* 3: 17, nom. illeg. 1790; Necker ex Desv. in *J. Bot. Agric.* 1: 122. 1813.

Prostrate herbs or small shrubs, the stipules free; leaves 1- or 3-foliolate, stipellate, the terminal leaf blade often broader than long; inflorescences terminal and axillary, racemose or narrowly paniculate, the pedicels single or paired, the bracts caducous, the bracteoles lacking; calyx broadly campanulate, papyraceous, reticulate-veined, accrescent and persistent after flowering, the lobes deltoid, acute, subequal, nearly as long as petals; petals 5, the standard obovate or orbiculate, not auricled, the wings obliquely oblong, adherent to keel, the keel petals slightly incurved; stamens 10, the filaments of 9 connate into a tube, the vexillary filament free, the anthers uniform; ovary with 2-8 ovules, the style curved, the stigma capitate; fruit subsessile or short-stipitate, deeply constricted between segments, plicate-retrofracted and included within calyx, the segments ovoid, indehiscent, the seeds subglobose, exarillate.

TYPE SPECIES: *Christia lunata* Moench, = *C. vespertinonis* (L. f.) Bakh. *f. (Hedysarum vespertilionis* L. f.).

DISTRIBUTION: Tropical and subtropical Asia through Malesia to northern Australia, with about ten species, at least one of which is widely cultivated as an ornamental, as in Fiji.

1. *Christia vespertilionis* (L. f.) Bakh. *f. in Reinwardtia* 6: 90. 1961; Backer & Bakh. *f. Fl. Java* 1: 612. 1963; J. W. Parham, *Pl. Fiji Isl. ed. 2.* 110. 1972.

FIGURE 40D.

Hedysarum vespertilionis L. *f. Suppl. Pl.* 331. 1782.

Lourea vespertilionis Desv. in *J. Bot. Agric.* 1: 122, *pl. 5, fig. 18*. 1813; Greenwood in *Proc. Linn. Soc.* 154: 96. 1943, in *J. Arnold Arb.* 30: 76. 1949; J. W. Parham, *Pl. Fiji Isl.* 75. 1964.

Herb or shrub with sprawling or erect stems, up to about 50 cm. high, sparsely cultivated and also locally naturalized on grassy hillsides and in clearings from near sea

level to about 100 m. The leaves are striking, the terminal (or only) leaflet blade being butterfly-shaped, much broader than long, 0.5–1.5 × 4–8 cm., often paler along main nerves, the lateral leaflet blades being much smaller and obovate. The inflorescences may reach a length of 40 cm., the rachis with straight and uncinata hairs, the petals white to yellowish, with purple markings, and the fruits with 2–6 segments. The only dated flowering specimens were obtained in March and July; the species is often collected in sterile condition because of its striking leaves.

TYPIFICATION: The original citation is: "*Habitat* in Regno Cochinchina. *Io. de Lourei*."

DISTRIBUTION: Southeastern Asia and probably parts of Malesia, widely cultivated for its unusual foliage and becoming naturalized elsewhere.

LOCAL NAME AND USES: *Mbekambeka* (Vanua Mbalavu). The plant is an ornamental curiosity because of its leaf shape. On Vanua Mbalavu the crushed leaves are said to be rubbed into the skin as a treatment for scabies.

AVAILABLE COLLECTIONS: VITI LEVU: RA: Rakiraki, DA 3294; Government Station, Vaileka, DA 8098; Penang, Greenwood 740; Ellington, Greenwood 740A; Waimave, DA 9543; without data but from the number probably also from Ra, DA 3297. VANUA MBALAVU: Central volcanic section, near Lomaloma, Smith 1512, Garnock-Jones 981. MANGO: Tothill 109. LAKEMBA: Tothill 109A.

The earliest collections appear to be those of Mrs. Tothill and Greenwood, probably dating from the 1920's. Except for three islands in Lau, the species seems established only along the Ra coast. Because it is well naturalized on Vanua Mbalavu, one may suggest that its first introduction into Fiji was into the Lomaloma Botanical Gardens (cf. vol. I of this *Flora*, p. 49), probably early in the century.

24. *ALYSICARPUS* Desv. in J. Bot. Agric. 1: 120. 1813; van Meeuwen in Reinwardtia 6: 86. 1961; Hutchinson, Gen. Fl. Pl. 1: 482. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Pabil. 491. 1971, Man. New Guinea Leg. 419. 1979. Nom. cons.

Annual or perennial herbs, erect or decumbent, the indument often of straight and uncinata hairs, the stipules scarious, acuminate, free or connate, persistent; leaves 1-foliolate (less often 3-foliolate), stipellate, the petiole channelled and narrowly winged; inflorescences terminal, axillary, or leaf-opposed, pseudoracemose or infrequently paniculate, the pedicels often paired, the bracts scarious, deciduous, the bracteoles none; calyx papery or glumaceous, persistent, deeply and subequally lobed, the lobes striate with conspicuous nerves, the 2 upper ones nearly completely connate; petals 5, the standard obovate to orbicular, not auricled, the wings obliquely oblong, adhering to keel, the keel petals slightly incurved, obtuse, often membranously appendaged on each side; stamens 10, the filaments of 9 connate into a tube, the free parts alternating in length, the vexillary filament free, the anthers uniform; ovary sessile or short-stipitate, the ovules several—many, the style filiform, distally incurved, the stigma broadly capitate; fruits subterete or slightly compressed, symmetrical along upper and lower margins, constricted between seeds or not, articulated, the articles rounded or short-cylindric and truncate at ends (as in our species), indehiscent, the seeds subglobose or ellipsoid, exarillate.

TYPE SPECIES: *Alysicarpus bupleurifolius* (L.) DC. (*Hedysarum bupleurifolium* L.). Typ. cons.

DISTRIBUTION: Paleotropical, with 25–30 species. Most species are considered useful fodder plants, including the one naturalized in Fiji.

1. *Alysicarpus vaginalis* (L.) DC. Prodr. 2: 353. 1825; Greenwood in Proc. Linn. Soc. 154: 96. 1943; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 103. 1948; Greenwood in J. Arnold Arb. 30: 76. 1949; J. W. Parham in Dept. Agr. Fiji Bull. 35: 95, fig. 47, f-i. 1959; van Meeuwen in Reinwardtia 6: 87. 1961; J. W. Parham, Pl. Fiji Isl. 70.

1964, ed. 2. 108. 1972; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 493. fig. 71 (A).
1971, Man. New Guinea Leg. 420. fig. 98, A-F. 1979.

Hedysarum vaginale L. Sp. Pl. 746. 1753.

Alysicarpus nummularifolius sensu Yuncker in Bishop Mus. Bull. 220: 141. 1959; non DC.

A prostrate or suberect perennial herb to 60 cm. high, originally cultivated but now considered a weed, often abundant in pastures and cultivated areas and along roadsides from near sea level to about 750 m. The unifoliolate leaves have the blades variable in shape and size, 0.5-6.5 × 0.5-3 cm.; the inflorescences attain a length of about 10 cm. and have small flowers, the petals being about 6 mm. long, orange or pinkish to purple. The subterete fruits are 1-2.5 cm. long, exserted from calyx, reticulate-nerved, with slightly raised borders between articles, and the seeds are brown to yellowish, about 1.5 mm. long. Flowers and fruits occur throughout the year.

TYPIFICTION: The type material was collected by Hermann in Ceylon (BM in Herb. Hermann 1: 27, 59, SYNTYPES).

DISTRIBUTION: Paleotropics, including Malesia, and widely introduced and naturalized elsewhere in tropical areas. About 40 collections have been made in Fiji.

USES: Doubtless originally introduced for pasture improvement, but more often considered a weed of little or no value. The earliest Fijian collection seems to be that of Yeoward, who may have introduced the species about the turn of the century (cf. Vol. 1 of this *Flora*, p. 52) as a potential fodder plant.

REPRESENTATIVE COLLECTIONS: VITI LEVU: Mba: Vicinity of Lautoka, *Greenwood 34*; hills in upper Sambeto River Valley, *Vaughan 3209*; Nandi, *DA 10284*; Tavua, *Greenwood 34A*; Nandarivatu, *Tothill 78*. NANDRONGA & NAVOSA: Singatoka Valley near road to Nasauthoko, *DA 9289 (McKee 2859)*; Singatoka, *Greenwood 34C*. RA: Yanggara, *DA 11871*; Nanunu-i-thake Island, *DA 2777*. NAITASIRI: Savura Creek, *DA 12559*. TAILEVU: Between Mburetu and Ndaku, *DA 2725*. REWA: Suva, *DA 12606*. KANDAVU: Ndavingele, *DA 2998*. OVALAU: Wainiloka, *DA 1348*. VANUA LEVU: THAKAUDROVE: Savusavu, *DA 8848*. NAITAMBA: *Tothill 105*. LAKEMBA: Near Tumbou, *Garnock-Jones 979*. FIJI without further locality, *Yeoward 47*.

Alysicarpus vaginalis and *A. ovalifolius* (Schumacher) Léonard are unsatisfactorily delimited (Verdcourt, 1971, cited above, whose illustrations of the fruits, fig. 71 (A, B) suggest that our species is the latter, whereas the spacing of flowers suggests the former). Intermediate material seems widespread, and by van Meeuwen (1961, cited above) *A. ovalifolius* is not considered separable from *A. vaginalis*. If varieties are recognized (Verdcourt, 1971) our material falls into var. *vaginalis*.

25. LESPEDEZA Michx. Fl. Bor.-Amer. 2: 70. 1803; Hutchinson, Gen. Fl. Pl. 1: 487. 1964; Verdcourt, Man. New Guinea Leg. 383. 1979.

Small shrubs, often with sericeous indument, the stipules free, small, caducous; leaves pinnately 3-foliolate (rarely 1-foliolate), estipellate, the leaflets entire; inflorescences axillary and fasciculate or racemiform, few-flowered, rarely terminal and paniculate, the primary bracts small, persistent, subtending 2 flowers, the bracteoles 2 at base of calyx, narrow, often persistent; calyx deeply lobed, the lobes subequal or the upper 2 shortly connate; petals 5 (occasionally lacking), the standard sometimes minutely auricled, the wings falcate-oblong, free or slightly adherent to keel, the keel petals straight; stamens 10 (occasionally lacking), the filaments of 9 connate in a tube, the vexillary filament free or rarely coherent to tube, the anthers uniform; ovary sessile or stipitate, 1-ovulate, the style filiform, incurved, the stigma small; fruits compressed-ellipsoid to -orbicular, indehiscent, the seed compressed-suborbicular, exarillate.

LECTOTYPE SPECIES: *Lespedeza sessiliflora* Michx., nom. illeg. = *L. virginica* (L.) Britton (vide Britton & Brown, Ill. Fl. N. U. S. ed. 2. 2: 402. 1913) (*Medicago virginica* L.).

DISTRIBUTION: Temperate North America and eastern Asia to tropical Australia, with about 40 species, one of which is cultivated in Fiji.

1. *Lespedeza cuneata* (Dum. Cours.) G. Don, Gen. Hist. Dichlam. Pl. 2: 307. 1832; Nakai, *Lespedeza* of Japan & Korea, 98. fig. A-C (p. 96); pl. (p. 97). 1927; Verdcourt, Man. New Guinea Leg. 385. fig. 91. 1979.

Hedysarum junceum L. f. Dec. Pl. Horti Upsal. pl. 4. 1762.

Hedysarum sericeum Thunb. Fl. Jap. 287. 1784.

Anthyllis cuneata Dum. Cours. Bot. Cult. ed. 2. 6: 100. 1811.

Lespedeza juncea DC. Prodr. 2: 348. 1825; non Pers. (1807).

Lespedeza sericea Miq. Ann. Mus. Bot. Lugd.-Bat. 3: 49. 1867; non Benth. (1852).

An erect shrub to 1 m. high, sparingly cultivated near sea level. The small leaves are crowded, the leaflet blades being narrowly obovate, emarginate, 10–20 × 3–10 mm., and grayish-sericeous beneath. The compact inflorescences are 2–4-flowered, the flowers having white to pale yellow and red-tinged petals, and the fruit being 3–4 mm. long and slightly narrower. Our specimens bore flowers and fruits in December.

TYPIIFICATION AND NOMENCLATURE: The species that has often passed as *Lespedeza juncea* or *L. sericea*, as indicated by Nakai (1927, cited above, where a full synonymy is given), is correctly to be known as *L. cuneata*, based on *Anthyllis cuneata*, Dumont de Courset's basionym, presumably described from a cultivated plant, providing the oldest epithet available in *Lespedeza*.

DISTRIBUTION: China and Japan to Malesia and Queensland, cultivated elsewhere.

USE: The species was probably introduced in the 1940's as a potential fodder crop, but perhaps it was grown only experimentally and has not become naturalized. Probably Fiji does not offer a suitable climate for this temperate species, which in New Guinea occurs only in highland areas.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Plant Introduction and Quarantine Station, Nanduruloulou, DA 4050; Principal Agricultural Station, Koronivia, DA 4051.

26. *ERYTHRINA* L. Sp. Pl. 706. 1753; Hutchinson, Gen. Fl. Pl. 1: 432. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 541. 1971; Krukoff & Barneby in Lloydia 37: 337. 1974; Verdcourt, Man. New Guinea Leg. 422. 1979.

Trees (all of our taxa) or shrubs, rarely perennial herbs, the trunk and branches often aculeate, the stipules usually small, persistent or deciduous; leaves pinnately trifoliolate, the stipels glandular, the leaflet blades pinnate-nerved, the lateral ones usually asymmetrical and smaller than terminal one; inflorescences terminal or axillary, pseudoracemose, often pyramidal and many-flowered, the showy flowers usually in fascicles of 2–5, sometimes single, the bracts and bracteoles deciduous; calyx with a rounded or turbinate hypanthium, sometimes ruptured by the emergent corolla and androecium, the limb entire, erose, variously lobed, or spathaceous, sometimes asymmetrical; petals 5, the standard the largest, erect or spreading, clawed or not, lacking appendages, the wings longer or shorter than keel, short-clawed, the keel petals free or connate, short-clawed; stamens 10, the filaments of 9 connate above middle, alternately longer and shorter, the vexillary filament free or connate to filament tube proximally, the anthers uniform, dorsifixed; ovary stipitate, usually linear or fusiform, pubescent, the ovules (2–) numerous, the style long, incurved, the stigma small, terminal; fruit stipitate, usually coriaceous or subligneous and linear-oblong, often falcate, constricted or sinuate between seeds, dehiscent (sometimes scarcely so), septate by endocarp or not, the seeds 1–14, ellipsoid to asymmetrically subglobose.

LECTOTYPE SPECIES: As pointed out by Krukoff and Barneby (1974, cited above), *Erythrina herbacea* L. was indicated as the type species of the genus by Walpers (in Flora 36: 145. 1853). The indication of *E. "coraliodendron"* (based on the 1924 selection by Britton and Wilson) by ING should therefore be corrected.

DISTRIBUTION: Pantropical and subtropical, with about 110 species and many horticultural forms and hybrids. Four taxa occur in Fiji, two indigenous, one intro-

duced and naturalized, and one a cultivated hybrid that is sometimes naturalized.

USEFUL TREATMENTS OF GENUS: A number of important studies of this taxonomically isolated and horticulturally important genus have been published; in our area the following well summarize present understanding of the taxa concerned. KRUKOFF, B. A. Notes on Asiatic-Polynesian-Australian species of *Erythrina*, II. *J. Arnold Arb.* 53: 128-139. 1972. KRUKOFF, B. A., & R. C. BARNEY. Conspectus of species of the genus *Erythrina*. *Lloydia* 37: 332-459. 1974. Additionally, a series of valuable *Erythrina Symposia*, with contributions from many authors, has been published as follows: I in *Lloydia* 37: 321-487, 543-588. 1974; II in *op. cit.* 40: 401-475. 1977; III in *Ann. Missouri Bot. Gard.* 66: 417-544. 1979; IV in *Allertonia* 3: 1-154. 1982.

KEY TO SPECIES

- Rachises, pedicels, calyces, ovary, and leaflets not stellate-pilose; calyx tube at anthesis expanding to accommodate the emergent corolla or split by it (but not more deeply than half its length); keel petals connate; leaflet blades longer than broad.
- Fruits slightly constricted between seeds, not sterile in proximal half (or fruits erratically developing in *E. × bidwillii*); calyx not or slightly contracted at base, the tube crateriform, about as broad as or broader than long, the margin entire to erose, not regularly bilabiate; keel petals partially united by exterior margins.
- Calyx tube asymmetrically crateriform; standard long-clawed, the claw about 1/3 as long as the suborbicular- to ovate-rhomboid blade; wings relatively ample, obovate, rounded at apex, about 1/2 as long as keel; keel petals obliquely ovate, obtuse at apex, 1/2-2/3 as long as standard; seeds opaque, umber to blackish with black markings; leaflet blades elliptic, up to 16 × 10 cm., rounded to subacute at base and apex; indigenous, occurring in freshwater swamps near coasts, rarely along rivers inland. 1. *E. fusca*
- Calyx tube essentially symmetrical; standard short-clawed, the claw less than 1/8 as long as the oblong-elliptic blade; wings lanceolate, subacute at apex, slightly shorter than keel; keel petals obliquely ovate-lanceolate, subacute at apex, about 1/2 as long as standard; leaflet blades rhomboid-ovate, 5-8 × 2.5-6 cm., cuneate at base, acute to acuminate at apex; cultivated and sparingly naturalized. 2. *E. × bidwillii*
- Fruits samaroid, in the proximal half sterile, compressed, winglike, indehiscent, in the distal half dilated by the few seeds but not constricted between them, the valves coriaceous, the seeds dark brown; calyx contracted at base into a turbinate hypanthium, the tube campanulate, longer than broad, deeply bilabiate; wings oblanceolate, obtuse or rounded at apex, about as long as keel; keel petals inaequaliterally oblong-elliptic, subacute at apex, completely united by exterior margins, about 1/2 as long as standard; standard short-clawed, the blade ovate or subelliptic; stipules large, cuplike; leaflet blades ovate to deltoid-rhomboid, up to 18 × 14.5 cm., acute to acuminate at apex; cultivated as shade for cocoa and coffee and sparingly naturalized. 3. *E. subumbrans*
- Rachises, pedicels, calyces, ovary (obviously when young), and leaflets (at least on petiolules and costa beneath) stellate-pilose with many-armed hairs; calyx tube in bud closed at orifice, early broken by the emergent corolla, at anthesis asymmetrical and deeply split on the vexillary side, the spathe-like limb opposite the standard; keel petals separate, obovate, rounded at apex, nearly as long as wings, these obovate, rounded, about 1/3 as long as standard; standard broadly elliptic, narrowed proximally to a short claw; fruits large, 15-30 cm. long and 2-3.5 cm. in diameter, not or slightly constricted between seeds, the valves coarsely reticulate-veined, the seeds large (up to 20 × 12 mm.), bright red to brownish red; leaflet blades ovate to broadly rhomboid, usually broader than long, up to 25 × 30 cm., truncate to slightly cordate at base, acute to acuminate at apex; indigenous and littoral, but sometimes cultivated and naturalized inland. 4. *E. variegata*

1. *Erythrina fusca* Lour. *Fl. Cochinch.* 427. 1790; Merr. in *Trans. Amer. Philos. Soc. n. s.* 24 (2): 209. 1935; Christophersen in *Bishop Mus. Bull.* 128: 103. 1935; Krukoff in *J. Arnold Arb.* 20: 229. 1939; Yuncker in *Bishop Mus. Bull.* 220: 145. 1959; J. W. Parham, *Pl. Fiji Isl.* 74. 1964, ed. 2. 113. 1972; Verdcourt in *Fl. Trop. E. Afr. Leg. Papil.* 547. 1971; Krukoff in *J. Arnold Arb.* 53: 130. 1972; Krukoff & Barney in *Lloydia* 37: 340. *fig.* 1974; Verdcourt, *Man. New Guinea Leg.* 424. 1979; Lucas & Theobald in *Allertonia* 3: 87. *fig. 1.* 1982.

Erythrina ovalifolia Roxb. *Hort. Beng.* 53, nom. nud. 1814, *Fl. Ind.* ed. 2. 3: 254. 1832; Seem. in *Bonplandia* 9: 255. 1861, Viti, 435. 1862, *Fl. Vit.* 60. 1865; Drake, *Ill. Fl. Ins. Mar. Pac.* 151. 1890.

As seen in Fiji, *Erythrina fusca* is a tree 5-10 m. high (up to 26 m. in Malesia) occurring in freshwater swamps slightly inland from coasts and rarely inland along

ivers. The trunk is often buttressed and the trunk and branches are spiny. The inflorescences may be as long as 40 cm.; the standard is yellowish orange to scarlet, 4–6.5 × 3.5–5.5 cm., and the wings and keel petals are yellowish and red-tinged (wings distally, keel proximally). The fruits are linear, slightly compressed, 14–33 cm. long, 1.4–1.8 cm. broad, with 6–12 seeds 12–18 × 5–8 mm. Recorded dates of flowering and fruiting are inconclusive.

TYPIFICATION AND NOMENCLATURE: Loureiro's original citation was: "Habitat in Cochinchina ad ripas fluminum spontanea." Verdcourt (1971, cited above) indicates as SYNTYPES a Loureiro collection (which he did not locate) from Indo-China and *Gelala aquatica* Rumph. Herb. Amb. 2: 235. t. 78. 1741. *Erythrina ovalifolia* was based on material from Calcutta, India, represented by Roxburgh drawing 972 (K LECTOTYPE; cf. Verdcourt, 1971). The latter name is among the many synonyms of *E. fusca* listed by Krukoff and Barneby (1974, cited above).

DISTRIBUTION: *Erythrina fusca* is the most widely dispersed species of the genus, being circumtropical and found on the continents of both the Old and New World as well as on many oceanic islands. The Malesian–Pacific part of the range extends eastward to Samoa and Tonga.

LOCAL NAMES: *Ndrala*, *ndrala kaka*, *ndrala ni vavalangi*; the last, reported from Lakemba, is a misnomer, as it implies an introduction.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandi, *Greenwood 733*; vicinity of Tavua, *Greenwood 733A*. NAMOSI: Naraiyawa, Wainikoroiuva River (about 22 km. inland!), *DA L.13278* (Berry 85). TAILEVU: Korovou, near hospital, *DA 15562*. VITI LEVU without further locality, *Seemann 124*. KANDAVU: Vicinity of Richmond, *Tothill 116*. LAKEMBA: Tumbou Valley, *Garnock-Jones 916*.

2. *Erythrina* × *bidwillii* Lindl. in Bot. Reg. 33: pl. 9. 1849; Krukoff in Brittonia 3: 214. 1939; Krukoff & Barneby in Lloydia 37: 443. fig. 1974.

Erythrina crista-galli sensu Yuncker in Bishop Mus. Bull. 178: 64. 1943, in op. cit. 220: 145. 1959; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 154. 1970; J. W. Parham, Pl. Fiji Isl. ed. 2. 112. 1972; non L.

A small tree 3–10 m. high cultivated near sea level as a street and garden tree, sometimes cultivated or sparingly naturalized inland at slightly higher elevations (to 250 m.). The racemes, up to 60 cm. long, bear flowers with a deep red calyx and bright red petals and filaments; the standard is 5–6 × 1.5–2 cm. Flowers have been obtained in Fiji in December, March, and April.

TYPIFICATION: Lindley's description was from a plant grown at Manchester in the 1840's, although the hybrid had first been made at the Royal Botanic Gardens in Sydney by J. C. Bidwill. This taxon is perhaps the best-known *Erythrina* hybrid between allopatric species, being in effect an "amphidiploid neospecies" (Krukoff and Barneby, 1974, cited above). The ♂ parent is *E. crista-galli* L., the ♀ parent *E. herbacea* L.

DISTRIBUTION: Widely grown as an ornamental in tropical areas and also in temperate greenhouses. This appears to be the only *Erythrina* hybrid that produces viable seeds, although these have somewhat impaired fertility (Krukoff and Barneby, 1974). In the Fijian Region and elsewhere in the Pacific the hybrid is occasionally cultivated, usually under the name *E. crista-galli*.

LOCAL NAME AND USE: The name *dadap* was recorded for *DA 12087*, but this is the Malayan word for the genus and in Fiji is usually applied to *Erythrina subumbrans*. *Erythrina* × *bidwillii* is an attractive ornamental.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Tholo-i-suva, *DA L.13398*. TAILEVU: Hills east of Wainimbuka River, in pasture near Ndakuivuna, *Smith 7006*. REWA: Lami, in private garden, *DA 16786*; Suva, *DA 7483*; Suva Botanical Gardens, *DA 12087*, 17222.

3. *Erythrina subumbrans* (Hassk.) Merr. in Philipp. J. Sci. Bot. **5**: 113. 1910, Enum. Philipp. Fl. Pl. **2**: 305. 1923; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 154. 1970; Krukoff in J. Arnold Arb. **53**: 130. 1972; J. W. Parham, Pl. Fiji Isl. ed. 2. 113. 1972; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 42. 1972; Krukoff & Barneby in Lloydia **37**: 355. fig. 1974.

Hypaphorus subumbrans Hassk. Hort. Bogor. Descr. Retz. 198. 1858.

Erythrina lithosperma sensu Miq. Fl. Ned. Ind. **1** (1): 209. 1855; J. W. Parham, Pl. Fiji Isl. 74. 1964; non Bl. (1823, nom. nud.) nec Hassk. (1825).

As seen in Fiji, *Erythrina subumbrans* is a tree up to 10 m. or more in height, cultivated near sea level or slightly higher and sparingly naturalized along roadsides. The inflorescences, up to 22 cm. in length, bear flowers with red standards 3.5–4 × 2–3 cm.; the wings and keel petals are greenish to pale red; and the fruits are 10–14 cm. long and 2–2.5 cm. broad, with 1–5 seeds. Flowers were noted in Fiji in July.

TYPIFICATION: *Hypaphorus subumbrans* was a new name proposed for the illegitimate homonym *Erythrina lithosperma* Miq., the type of which was a Javanese specimen.

DISTRIBUTION: Southeastern Asia to Malesia (presumably eastward to the Philippines, Moluccas, and Timor), cultivated and sometimes naturalized elsewhere. The time of its introduction into Fiji is uncertain, but possibly this species was intended by Thurston in his 1886 *Catalogue*, where he listed *Erythrina picta*. The latter name is a synonym of *E. variegata*, which Thurston doubtless knew as the seashore plant indigenous in Fiji and which he would not have confused with the useful *E. subumbrans*.

LOCAL NAME AND USE: The Malayan word for the genus, *dadap*, is applied to *Erythrina subumbrans* in Fiji and Niue. The species is commonly used as a shade for cocoa and coffee and has become occasionally naturalized.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Plant Introduction and Quarantine Station, Nanduruloulou, DA 9557; Nanduruloulou, DA 17401.

4. *Erythrina variegata* L. Herb. Amb. 10. 1754, Amoen. Acad. **4**: 122. 1759; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. **549**. 1971; Krukoff in J. Arnold Arb. **53**: 132. 1972; Krukoff & Barneby in Lloydia **37**: 431. fig. 1974; Verdcourt, Man. New Guinea Leg. **425**. fig. 100. 1979.

Erythrina corallodendrum var. *orientalis* L. Sp. Pl. 706. 1753.

Erythrina indica Lam. Encycl. Méth. Bot. **2**: 391. 1786; A. Gray, Bot. U. S. Expl. Exped. **1**: 444. 1854; Seem. in Bonplandia **9**: 255. 1861, Viti, 435. 1862, Fl. Vit. **60**. 1865; J. W. Parham in Agr. J. Dept. Agr. Fiji **29**: 32. 1959.

Erythrina variegata var. *orientalis* Merr. Interpret. Rumph. Herb. Amb. 276. 1917; Christophersen in Bishop Mus. Bull. **128**: 103. 1935; Krukoff in J. Arnold Arb. **20**: 228. 1939; A. C. Sm. in Sargentia **1**: 39. 1942; Yuncker in Bishop Mus. Bull. **178**: 64. 1943, in op. cit. **220**: 146. 1959; J. W. Parham, Pl. Fiji Isl. 74. 1964, ed. 2. 113. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 155. 1970; St. John & A. C. Sm. in Pacific Sci. **25**: 328. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 42. 1972.

Erythrina variegata, as seen in Fiji, is an often spreading tree 3–10 m. high (sometimes more than 25 m. high elsewhere), frequent along coasts and widely cultivated and sometimes naturalized inland. Its trunk, up to 1 m. in diameter, and branches are coarsely spiny. Its leaves are very variable in size, with petioles (6–) 9–25 cm. long, petiolules 5–14 mm. long, and leaflet blades 4–25 × 3–30 cm. The inflorescences, up to 45 cm. long, bear striking flowers; the standard is orange-red to crimson or scarlet, 5–8 × 2–3.5 cm.; the filaments and style are red, as are the large seeds. Flowering is most abundant between July and September, fruiting somewhat later.

TYPIFICATION: The entire basis of the Linnaean binomial is *Gelala alba* Rumph.

Herb. Amb. 2: 243. t. 77. 1741. *Erythrina corallodendrum* var. *orientalis* is based on Rheede, Hort. Ind. Malabar. 6: 13. t. 7. 1686. In proposing *E. indica*, Lamarck cited *Gelala litorea* Rumph. Herb. Amb. 2: 230. t. 76. 1741, as well as the Rheede illustration mentioned above. The complete synonymy of this widespread species is discussed by Krukoff (1972, cited above).

DISTRIBUTION: Zanzibar and other Indian Ocean islands north to India, China, and Ryukyu Islands, and eastward through Malesia into the Pacific to the Societies and Marquesas, widely cultivated elsewhere, sometimes as an early introduction. The species is more abundant in Fiji than indicated below, where all examined specimens are cited because of the scattered localities.

AVAILABLE COLLECTIONS: YASAWAS: WAYA: Yalombi, *St. John 18091, Weiner 254*. VITI LEVU: MBA: Lautoka, *Greenwood 736*; hills near Lautoka, *Greenwood 788* (coll. *H. R. Phillips*); Nandarivatu road, *Vaughan 3263*. NANDRONGA & NAVOSA: Roadside north of Singatoka, *DA 16994*. RA: Penang, *Greenwood 736A*. TALEVU: Mbuthalevu, *DA 10959*. NAITASIRE: Roadside between Naluwai and Nanggali, *DA 16695*. VITI LEVU without further locality, *Graeffe 61*. MBENGGGA: *Weiner 72-7-79*. OVALAU: Vicinity of Thawathi, *Smith 8105*. MAKONDRONGA: *Degener & Ordonez 13803*. MATUKU: *Moseley, July, 1874, Bryan 235*. TOTOYA: *Bryan 349*. LAKEMBA: Near Tumbou Jetty, *Garnock-Jones 796*. ONEATA: *Bryan, Aug. 19, 1924*. ONGEA LEVU: *Bryan 434*. FIJI without further locality, *U. S. Expl. Exped., Williams s. n., Seemann 125*.

Seemann (Fl. Vit. 60. 1865) also mentioned a var. β of *Erythrina indica* with white flowers, but later (op. cit. 426. 1873) he opined that this variety might belong to *E. ovalifolia* (i. e. *E. fusca*). I find no other mention of a white-flowered form in either of these species in the Pacific.

27. STRONGYLODON Vogel in Linnaea 10: 585. 1836; A. Gray, Bot. U. S. Expl. Exped. 1: 445. 1854; Seem. Fl. Vit. 60. 1865; Hutchinson, Gen. Fl. Pl. 1: 432. 1964; Verdcourt, Man. New Guinea Leg. 429. 1979.

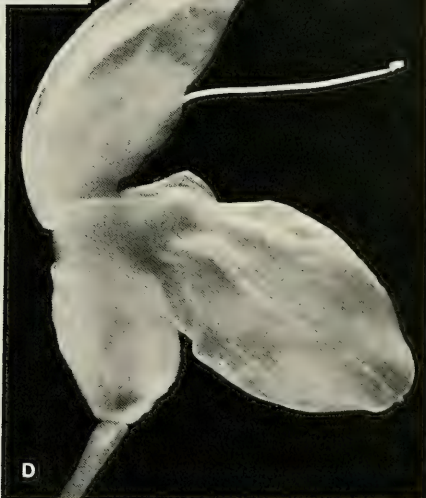
Scandent shrubs or lianas, the stipules small; leaves pinnately trifoliolate, stipellate, the stipels conspicuous, parallel-nerved, at length caducous; inflorescences axillary, pseudoracemose, the racemes solitary or in few-branched panicles, usually pendulous and long-pedunculate, the bracts small, the flowers usually showy, borne in fascicles from nodules on rachis, the bracteoles orbicular or ovate, small, caducous; calyx tube subtruncate or with broad, obtuse lobes, these marginally overlapping or separated by narrow sinuses, the upper 2 scarcely or completely connate; petals 5, the standard ovate-oblong, acute, at length reflexed, with 2 appendages above claw, the wings much shorter than standard, adhering to keel, the keel petals joined, incurved, rostrate, subequal to standard in length; stamens 10, the filaments of 9 connate into a tube; the vexillary filament free from base, filiform, the anthers uniform; ovary stipitate, the ovules 1-several, the style filiform, the stigma small, terminal; fruits stipitate, obliquely ovoid-oblong to subglobose, dehiscent, the valves often reticulate-nerved, the seeds subglobose to somewhat compressed, the hilum conspicuous, linear, extending to half the circumference of seed or more.

TYPE SPECIES: *Strongylodon ruber* Vogel.

DISTRIBUTION: Madagascar and Mascarenes to Ceylon, eastward through Indo-Malesia to Queensland and into the Pacific to the Societies and Hawaii, with about 20 species. Two species occur in Fiji, one indigenous and one cultivated.

KEY TO SPECIES

Petals orange to pinkish red, the largest ones 1.5-2.6 cm. long; inflorescences 5-50 cm. long; fruits 1- or 2-seeded, the body 3-7.5 cm. long, 2.2-4.3 cm. broad, 1.1-2.6 cm. thick, the stipe 0.8-1.8 cm. long, the beak 0.8-1.2 cm. long; seeds subglobose to slightly flattened, 14.5-20 × 12-18 × 8-16 mm., the hilum extending around the seed margin for about 1/2 the circumference; leaflet blades ovate to elliptic, (4.5-) 6-15 cm. long, (2.5-) 4-12.8 cm. broad, rounded to truncate-obtuse at base, abruptly acuminate or cuspidate at apex (tip (3-) 5-13 mm. long); indigenous. *I. S. lucidus*



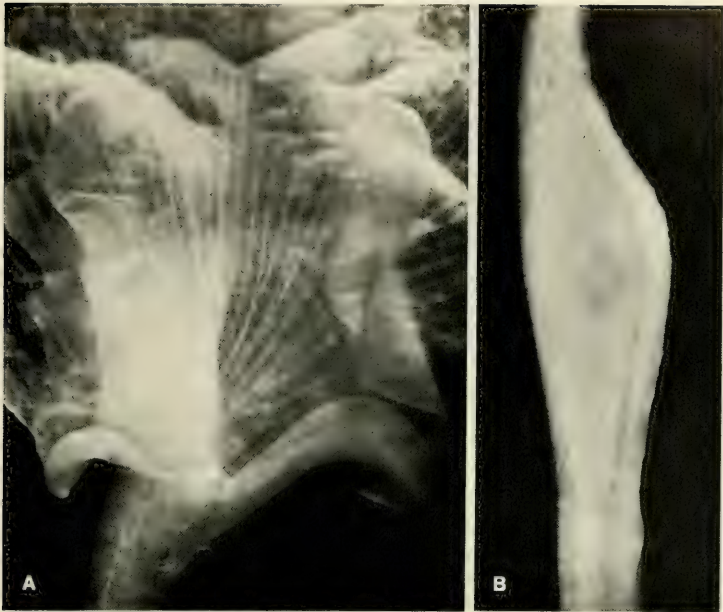


FIGURE 42. *Strongylodon lucidus*, from DA 14346; A, basal portion of standard blade, showing appendages, $\times 15$; B, ovary with one ovule, $\times 20$.

Petals bluish green or jade-green, the largest ones 3.7–6 cm. long; inflorescences 70–300 cm. long; fruits (3–) 6–12-seeded, the body 10–15 cm. long, the seeds 3.5–5 cm. long; leaflet blades lanceolate to ovate- or elliptic-oblong, 9–17 cm. long, 3.5–7 cm. broad, broadly obtuse or cuneate at base, bluntly acuminate at apex (tip 10–13 mm. long); cultivated only. 2. *S. macrobotrys*

1. ***Strongylodon lucidus*** (Forst. f.) Seem. Fl. Vit. 61, as *S. lucidum*. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 151, as *S. lucidum*, p. p. excl. spec. haw. 1890; J. W. Parham, Pl. Fiji Isl. 77. 1964, ed. 2. 118. 1972. FIGURES 41, 42.

Glycine lucida Forst. f. Fl. Ins. Austr. Prodr. 51. 1786.

Strongylodon ruber sensu A. Gray, Bot. U. S. Expl. Exped. 1: 446, p. p., quoad spec. vit. 1854; Seem. in Bonplandia 9: 255. 1861, Viti, 435. 1862; A. Gray in Proc. Amer. Acad. Arts 5: 317. 1862; non Vogel.

Strongylodon siderospermus sensu Verdcourt, saltem p. p., in Kew Bull. 32: 457. 1978, Man. New Guinea Leg. 432. fig. 101 (F-H). 1979; forsan non Cordemoy.

In Fiji *Strongylodon lucidus* is an often high-climbing liana, occurring in forest or on its edges at elevations from near sea level to 750 m. Its striking flowers have orange or pinkish red petals, and its fruits are oblong-ellipsoid, turning from yellow-green to brown, with prominulous reticulate venation and reddish brown to black seeds. Our specimens bore flowers in April, May, and November, mature fruits (as far as dated) only in May.

FIGURE 41. *Strongylodon lucidus*, from DA 14346; A, distal portion of stem, with foliage and inflorescences, $\times 1/4$; B, inflorescence, $\times 1$; C, calyx, with marginally imbricate lobes, $\times 10$; D, flower, the bracteoles fallen, the standard reflexed, the vexillary stamen free, the style projecting from keel petals, $\times 4$.

TYPIFICATION: At BM there are two herbarium sheets, both with mature fruits, collected in 1769 in Tahiti by Banks and Solander during Cook's first voyage, one of them labelled "Glycine lucida Mscr." This is the only BM herbarium material of the species from the Cook voyages, but in the BM library there is an unpublished drawing (t. 197, as noted by Seemann in 1865) of a specimen in flower and fruit collected in Tahiti on May 3, 1774, and indicated as "Glycine lucida Fl. Austr. p. 51. n. 272." Presumably G. Forster had such material at hand when he described *Glycine lucida*. Nevertheless, his description mentions fruits and not flowers, and one must assume it to have been based primarily on the earlier collection: *Banks & Solander* (BM LECTOTYPE), collected in Tahiti between April and July, 1769.

DISTRIBUTION: As here interpreted, *Strongyloдон lucidus* in a fairly restricted sense occurs from New Guinea and Queensland through the Bismarck Archipelago and the Solomons to the New Hebrides and Fiji, and also in the Society Islands; its possibly wider occurrence is discussed below. It is not frequent in Fiji, being known from only a few collections from three of the high islands.

AVAILABLE COLLECTIONS: VITILEVU: MBA: Vicinity of Nandarivatu, DA 11822. SERUA: Serua hills, DA 14346. NAITASIRI: Waimbau Creek, Waimanu River tributary, DA 12077. REWA: Namboro Farm, DA L.10458; Lami, near entrance to quarry, Tothill 476. OVALAU: U. S. Expl. Exped. TAVEUNI: Seemann 113. FIJI without further locality, Horne 1046.

Some reservations must be expressed in interpreting the range of *Strongyloдон lucidus* to include Fijian and other Melanesian and New Guinean specimens, in part because of its apparent absence from areas between Tahiti and Fiji. The species in Samoa (cf. Christophersen in Bishop Mus. Bull. 128: 103. 1935) and Tonga (cf. Yuncker in op. cit. 220: 146. 1959) is clearly not *S. lucidus*, having flowers more than twice as large, as well as larger fruits (the body up to $8 \times 6 \times 2.5$ cm.) and seeds (up to $26 \times 25 \times 24$ mm.) with the hilum extending around the seed margin for about $2/3$ the circumference. The Samoan-Tongan species seems to be undescribed.

Verdcourt (1978, 1979, cited above) has taken *Strongyloдон siderospermus* Corde-moy (type from La Réunion) as the correct name for material of this immediate relationship from Madagascar to Ceylon and eastward to Queensland, the New Hebrides, and Fiji, reducing to it *S. pseudolucidus* Craib (type from Madagascar), *S. secundus* St. John (type from Solomon Islands), and "*S. lucidus* aucct. non (Forst. f.) Seem." Such material has narrowly imbricate calyx lobes and one or two ovules and seeds.

In *Strongyloдон lucidus* from Tahiti and Fiji the inflorescences are simple pseudoracemes, but in other Melanesian and New Guinean material the inflorescences seem to be either simple or compound (with as many as five racemes scattered along the rachis of the panicle, as typical for *S. secundus*). In occasional New Guinean collections (e. g. *Kanis 1017*) the inflorescences may be either simple or with two racemes from a rachis, thus suggesting that this character may not separate *S. secundus* from *S. lucidus*. Leaf, flower, and fruit characters in this complex (i. e. specimens from Tahiti and Fiji to New Guinea) vary from specimen to specimen within reasonable limits.

Reasons for the acceptance by Verdcourt of the binomial *Strongyloдон siderospermus* (1895) rather than *S. lucidus* are not clear. I am unable to perceive any characters that permit separation of the Tahitian *S. lucidus* (of which, however, no Tahitian material except the lectotype has been seen by me) from material of "*S. siderospermus*" as it occurs in Melanesia and New Guinea, with the exception of those specimens that

could be separated as *S. secundus* solely because of their obvious and consistent compound inflorescences. Since *S. lucidus* has more than a century of priority, I believe that it should be applied to the concept that Verdcourt refers to *S. siderospermus*, with the reservation that I cannot comment on collections from Madagascar, the Mascarenes, Ceylon, and Malaya. Material from Micronesia is probably not separable, but the status of *S. secundus* requires reexamination.

The genus is in need of a complete revision; the disposition of one element as here suggested may not be acceptable to an ultimate reviser. Harold St. John has long been interested in the genus and has assembled many drawings and notes pertaining to it; use of his notes in interpreting the taxa here mentioned is appreciated.

2. ***Strongylodon macrobotrys*** A. Gray, Bot. U. S. Expl. Exped. 1: 448. 1854, Atlas, pl. 49. 1856; J. W. Parham, Pl. Fiji Isl. ed. 2. 118. 1972; Polhill in Bot. Mag. 179: t. 627. 1973; Verdcourt, Man. New Guinea Leg. 432. 1979.

A woody climber, often forming vigorous masses, in Fiji in cultivation only and seen from near sea level to about 250 m. elevation. The flowers have bluish green or jade-green petals. Flowers were noted in July, fruits in December and January.

TYPIFICATION: The type is *U. S. Expl. Exped.* (US 40713 HOLOTYPE), collected in 1842 in mountains near Baños, Luzon, Philippine Islands.

DISTRIBUTION: Endemic to the Philippines, but now widely cultivated.

LOCAL NAME AND USE: The well-known *jade vine* is a striking ornamental.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Toninaiwau, Tholo-i-suva, DA 16991.

28. ***MUCUNA*** Adanson, Fam. Pl. 2: 325, 579. 1763; Seem. Fl. Vit. 59. 1865; Hutchinson, Gen. Fl. Pl. 1: 433. 1964; Verdcourt in Kew Bull. 24: 286. 1970, in Fl. Trop. E. Afr. Leg. Papil. 561. 1971, Man. New Guinea Leg. 433. 1979. Nom. cons.

Stizolobium P. Br. Hist. Jam. 290. 1756. Nom. rejic.

Woody lianas or climbing herbs, rarely erect shrubs, the stipules deciduous; leaves pinnately trifoliate, often stipellate; inflorescences axillary or borne on defoliate stems, pseudoracemose or paniculate, the bracts and bracteoles caducous or infrequently subsistent, the flowers showy; calyx tube campanulate, 2-lipped, the 2 upper lobes connate to form an entire or bifid lip; petals 5, the standard rounded, with inflexed auricles, shorter than other petals, the wings oblong or ovate, incurved, often adherent to keel, the keel petals equal to or longer than wings, incurved and stiffened at apex; stamens 10, the filaments of 9 connate, the vexillary filament free, the 5 larger anthers subbasifixed, alternate with 5 versatile or dorsifixed, often barbate ones; ovary sessile, the ovules few, the style filiform, the stigma small, terminal; fruits ovoid to oblong or linear, often with stinging hairs, septate or filled between seeds, dehiscent (but sometimes scarcely opening), the valves thick, variously ribbed or not, the seeds subglobose to oblong and with a short or linear hilum and a conspicuous rim-aril, or discoid and with an elongated hilum and without a rim-aril.

TYPE SPECIES: *Mucuna urens* (L.) DC. (*Dolichos urens* L.), typ. cons. The lectotype species of *Stizolobium* is *S. pruriens* (L.) Medik. (*Dolichos pruriens* L.) (vide Kuntze, Rev. Gen. Pl. 1: 207. 1891). *Mucuna* has sometimes been divided between *Mucuna* proper and *Stizolobium*. Verdcourt (1970, cited above) discusses some of the differences and similarities between the two groups.

DISTRIBUTION: Pantropical and subtropical, with about 100 species. Five species are found in Fiji, three indigenous and two cultivated, one of them sparingly naturalized.

KEY TO SPECIES

Fruits (in our variety) somewhat S-shaped, longitudinally ridged, glabrous to appressed-tomentose but lacking irritant bristles, up to 10×2 cm., the seeds 4-7, up to $19 \times 13 \times 8$ mm., with a short, oblong hilum 4-8 mm. long and with a cream-colored rim-aril; petals dark purple, the longest ones 3-3.7 cm. long; lateral leaflet blades strongly asymmetrical, up to 19 cm. long; climbing or twining herb, cultivated as a cover crop or for cattle-food and sparingly naturalized. 1. *M. pruriens*

Fruits oblong, not longitudinally ridged, often (like calyx) with irritant bristles, at least 3 cm. broad at maturity, the seeds usually 2-5, often larger than 20×20 mm., with an elongate hilum and without a rim-aril; petals usually at least 3.5 cm. long; lateral leaflet blades oblique; lianas, often robust and high-climbing.

Petals scarlet to orange-red, the longest ones usually 5-8 cm. long; calyx lobes scarcely developed, the limb at maturity subtruncate; fruits linear-oblong, $16-27 \times 4.2-5.5$ cm., the margins not winged, the valves with very low transverse lamellae, the seeds 2-5, 40-45 mm. long and broad; leaflet blades usually glabrous, up to 19×13 cm.; cultivated as an ornamental. 2. *M. novo-guineensis*

Petals pale green to yellowish (perhaps rarely orange-tinged), the longest ones not more than 5.5 cm. long; calyx lobes apparent; fruits oblong, (8.5-) $10-15 \times (3-)$ $3.5-5.5$ cm., densely pilose with stiff, irritant bristles but at length subglabrate, the margins with 2 obvious wings 5-10 mm. broad bordering each suture, the seeds (1-) 2 or 3 (-5?), not more than 30 mm. long and broad, the hilum extending around the seed margin for $3/4-5/6$ the circumference; indigenous species.

Young branches, leaves, and inflorescences (except calyx) glabrous or at least soon glabrate; inflorescences usually long-pedunculate but with a short rachis and flowers sometimes appearing to be subumbellate (but sometimes with a long rachis and spaced fascicles of flowers); bracts and bracteoles inconspicuous and fugacious, the bracts up to 7×2.5 mm., the bracteoles up to 14×5 mm.; calyx lobes deltoid, often broadly so, 2-4 mm. long; fruits without transverse lamellae; leaflet blades elliptic to ovate, up to 13×9 cm., broadly obtuse to subcordate at base, glabrous.

3. *M. gigantea*

Young branches, leaves, and inflorescences (including calyx, bracts, and bracteoles) with a copious, soft, pale to dark ferruginous indument; inflorescences broadly to narrowly cymose-paniculate, sometimes freely branched; bracts and bracteoles conspicuous, papyraceous, often persistent until full anthesis; calyx lobes elongate-deltoid, 7-12 (-20) mm. long; fruits with obliquely transverse, sharply salient lamellae; leaflet blades elliptic to broadly ovate, (7-) $10-15 \times (4.5-)$ $7-16$ cm., broadly obtuse to rounded at base, with a copious indument, tardily glabrate above.

Indument of petioles, petiolules, principal nerves of lower surfaces of leaflet blades, bracts, and bracteoles usually dark ferruginous, the hairs 0.3-1 mm. long, a few seldom longer; leaflet blades short-cuspidate or abruptly apiculate at apex, the actual tip blunt, not subulate, about 5 mm. long and about as broad at its base; bracts comparatively small, ovate-lanceolate, 9-12 \times 4-6 mm., acute, the bracteoles 9-12 \times 2-4 mm., acute; fruits oblong, 10-14 cm. long, 4.5-5 cm. broad, not narrowed proximally except for the abrupt stipe about 5 mm. long, the transverse lamellae 14-16, oblique at an angle of about 30-45° (from horizontal), the seeds 3 (as far as known). 4. *M. platyphylla*

Indument of petioles, petiolules, principal nerves of lower surfaces of leaflet blades, bracts, and bracteoles pale ferruginous to yellowish, the hairs (1-) 1.5-3 (-4) mm. long, sometimes mixed with shorter ones; leaflet blades abruptly acuminate at apex, the actual tip 5-12 mm. long and narrower at its base, with a terminal minutely subulate-lanceolate portion 1-3 mm. long that readily becomes broken and detached; bracts comparatively large, ovate-elliptic, 25-30 \times 20-25 mm., caudate-acuminate, the bracteoles 20-30 \times 5-10 mm., gradually acuminate; fruits oblong or slightly obovate, (8.5-) 10-14 cm. long, (3-) 3.5-4.5 cm. broad, sometimes narrowed proximally to a stipe 10-15 mm. long (or more gradually narrowed when lowermost seed is undeveloped), the transverse lamellae 8-13, steeply oblique at an angle of about 45-60° (from horizontal), the seeds 1, 2, or 3 (-5?). 5. *M. stanleyi*

1. *Mucuna pruriens* (L.) DC. Prodr. 2: 405. 1825; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 566. 1971, Man. New Guinea Leg. 451. 1979.

Dolichos pruriens L. Herb. Amb. 23. 1754.

TYPIFICATION: The species is based on Rumph. Herb. Amb. 5: t. 142. 1747.

DISTRIBUTION: Africa and Madagascar to tropical Asia and Malesia, some cultivars being grown throughout the tropics. In Fiji the species is represented only by subsp. *pruriens* var. *utilis*.

1a. *Mucuna pruriens* subsp. *pruriens* var. *utilis* (Wight) Burck in Ann. Jard. Bot. Buitenzorg 11: 187. 1893; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 567. 1971,

Man. New Guinea Leg. 451. *fig. 107 (E)*. 1979.

Mucuna utilis Wall. ex Wight, Icon. Pl. Ind. Orient. 1: t. 280. 1840.

Stizolobium aterrimum Piper & Tracy in U. S. Dept. Agr. Bur. Pl. Ind. Bull. 179: 18. t. 4, *fig. B, t. 7*. 1910; Purselglove, Trop. Crops, Dicot. 220. *fig. 33, B*. 1968.

Mucuna aterrima Merr. Interpret. Rumph. Herb. Amb. 279. 1917; Yuncker in Bishop Mus. Bull. 178: 64. 1943; Greenwood in Proc. Linn. Soc. 154: 97. 1943; J. W. Parham, Pl. Fiji Isl. 75. 1964, ed. 2. 114. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 157. 1970.

Climbing or twining, annual or short-lived perennial herb, in Fiji cultivated and sometimes sparingly naturalized at low elevations up to about 200 m. The strongly asymmetrical lateral leaflet blades may be as long as 19 cm. The pendulous inflorescences, up to 40 cm. or more long, bear many flowers with dark purple petals. The only herbarium voucher bore fruits in June.

TIPIFICATION AND NOMENCLATURE: *Mucuna utilis* was based by Wight on a manuscript name of Wallich, presumably taken from collections by the latter. *Stizolobium aterrimum* was described from specimens originating in various tropical areas. The several "species" of *Stizolobium* distinguished by Piper and Tracy are now considered cultivars of *Mucuna pruriens* (cf. Verdcourt, 1971, cited above).

DISTRIBUTION: Probably first grown in Asia, but now widely cultivated throughout the tropics.

LOCAL NAMES AND USES: The *Mauritius bean* is also often known as *velvet bean* or *Bengal bean*. It is used as a cover crop and for green manure, and the seeds and pods are used as cattle-food.

AVAILABLE COLLECTION: VANUA LEVU: MATHUATA: District Farm Northern, Seangangga Plateau, DA 16686.

2. *Mucuna novo-guineensis* Scheffer in Ann. Jard. Bot. Buitenzorg 1: 18. 1876; J. W. Parham, Pl. Fiji Isl. ed. 2. 114, as *M. novaeguineensis*. 1972; Verdcourt, Man. New Guinea Leg. 450. *fig. 104, 107 (A)*. 1979.

A robust liana, occasionally cultivated at low elevation in Fiji as a trellis plant. The inflorescences, up to 60 cm. in length, produce magnificent hanging bunches of flame-colored flowers. The fruits (not seen in Fiji) may be up to 27 cm. long and 5.5 cm. broad, the valves with low transverse lamellae, and the seeds as large as 45 × 45 × 17 mm. Flowers are borne in Fiji between August and October.

TIPIFICATION: Scheffer's description was based on specimens collected by Teijsmann in several New Guinean localities.

DISTRIBUTION: Probably endemic to New Guinea (or possibly also occurring in the Moluccas), now frequently cultivated in other tropical areas.

LOCAL NAMES AND USE: This striking ornamental is known as *New Guinea creeper* or *flame of the forest*.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Tholo-i-suva, CHR 181774.

3. *Mucuna gigantea* (Willd.) DC. Prodr. 2: 405. 1825; A. Gray, Bot. U. S. Expl. Exped. 1: 442. 1854; Seem. in Bonplandia 9: 255. 1861, Viti, 435. 1862, Fl. Vit. 59. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 152. 1890; Christophersen in Bishop Mus. Bull. 128: 104. 1935; Yuncker in op. cit. 178: 64. 1943, in op. cit. 220: 146. 1959; J. W. Parham, Pl. Fiji Isl. 75. 1964, ed. 2. 114. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 157. 1970; Verdcourt in Kew Bull. 24: 287. 1970, in Fl. Trop. E. Afr. Leg. Papil. 564. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 35, 41. 1972; Verdcourt, Man. New Guinea Leg. 443. *fig. 106 (F)*. 1979. FIGURE 43.

Dolichos giganteus Willd. Sp. Pl. 1: 1041. 1802.

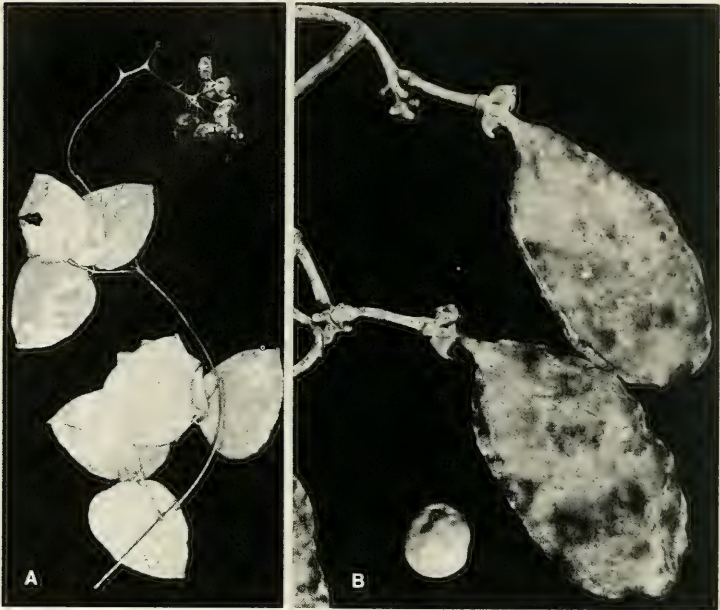


FIGURE 43. *Mucuna gigantea*: A, distal portion of stem, with foliage and an inflorescence, $\times 1/4$; B, mature fruits and a seed, $\times 1/2$. A from DA 15371, B from Bryan 254.

An often high-climbing liana, with the stem to 3 cm. or more in diameter, occurring from sea level to an elevation of perhaps 200 m., usually in coastal thickets or on creek banks but sometimes in dry lowland forest. The inflorescences, often borne on the stem below leaves, are usually long-pedunculate but with a short rachis and with flowers sometimes appearing to be subumbellate; occasionally the rachis is longer and the flowers are in well-spaced fascicles. The longest petals are usually 3.5–4.5 cm. long, and seeds have been noted 20–29 mm. long and broad and 7–18 mm. thick. Flowers occur between May and December, and fruits seem mature from May to July.

TYPIFICATION: Willdenow based his species on Rheede, Hort. Ind. Malabar. 8: 63. t. 36. 1688.

DISTRIBUTION: The species as a whole occurs from Africa and Indian Ocean islands to India and China and eastward into Polynesia. Verdcourt (1970, 1971, cited above) places the African and Indian Ocean material in subsp. *quadrialata* (Baker) Verdcourt. Subspecies *gigantea* has a wide distribution from India and China through Malesia to Australia and eastward in the Pacific to the Societies and Hawaii. The species is frequent in coastal thickets and its seeds are readily seaborne. Because of their scattered localities, all Fijian collections examined are here listed.

LOCAL NAMES AND USE: Fijian names are *wa kore*, *wa kurikuri*, and *wa tikuri*; in the Yasawas the seeds have been noted as edible.

AVAILABLE COLLECTIONS: YASAWAS: WAYA: Yalombi, *St. John 18092*. VITI LEVU: MBA: Junction of Visi (Vise?) and Sambu Creeks (probably in drainage of Teindamu River, Vunda Tikina), *DA 14750*. NANDRONGA & NAVOSA: Malangerenggere, Thuvu Tikina, *Tothill 113*. RA: Vatundamu, vicinity of Rewasa, near Vaileka, *Degener 15391*; vicinity of Penang, *Greenwood 798*. NAITASIRI: Near Nasinu, *Greenwood 1109*. TAILEVU: Matavatathou, *DA 15371*. KANDAVU: Western end of island, near Cape Washington, *Smith 320*. OVALAU: *U. S. Expl. Exped.* NGAU: Hills east of Herald Bay, inland from Sawaikie on slopes of Mt. Vonda and toward Waikama, *Smith 7949*. VANUA LEVU: MBUA: In dry zone of Naivakasinga, *B. & H. Parham 3*. VANUA LEVU without further locality, *U. S. Expl. Exped. TAVEUNI: Somosomo, Seemann 119*. MATUKU: *Bryan 254*. NAMUKA-I-LAU: *Bryan*, Aug. 12, 1924 (seeds only). ONGEA NDRIKI: *Bryan 411*. FIJI without further locality, *Horne 721*.

Two of the cited specimens, *DA 14750* and *Greenwood 1109*, are unusual in having elongate (15–40 cm. long) and short-pedunculate inflorescences, the rachis 1–2 cm. between fascicles of flowers, and petals recorded as orange or “yellowish to pink.” In other respects these specimens appear typical for *Mucuna gigantea*.

4. *Mucuna platyphylla* A. Gray, Bot. U. S. Expl. Exped. 1: 443. 1854; Seem. in *Bonplandia* 9: 255. 1861, Viti, 435. 1862, Fl. Vit. 59. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 152. 1890; J. W. Parham, Pl. Fiji Isl. 75. 1964, ed. 2. 115. 1972.

FIGURE 44B (pods only).

An often high-climbing liana, occurring from near sea level to an elevation of about 1,000 m. in forest or on its edges or in hillside thickets. The inflorescences are 8–25 cm. long, the longest petals being 4.5–5.5 cm. long, pale green to yellowish and sometimes with dull purplish markings. The fruits are winged at the sutures and with sharply raised lamellae oblique at a small angle (about 30°) from the horizontal, and the seeds are sometimes as large as 30 × 27 × 10 mm. Flowers have been noted as collected between April and July, fruits maturing about six months later.

TIPIFICATION: Gray recorded Exploring Expedition material from Ovalau and Viti Levu (Rewa Province); only one sheet is now available at US, but it does not bear a locality: *U. S. Expl. Exped.* (US 47902 HOLOTYPE), collected in 1840 on either Ovalau or Viti Levu.

DISTRIBUTION: Fiji (thus far known only from Viti Levu, Ovalau, Vanua Levu, and Taveuni) and Tonga (apparently rare, seen only from ‘Eua: *Sykes 186/T, CHR 317121B*).

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Slopes of Mt. Nairoso, eastern flank of Mt. Evans Range, *Smith 4405*. NAMOSE: Nakavu, on Navua River, *Parks 20394*. TAILEVU: Vicinity of Nausori, *Greenwood 254A* (coll. *R. Veitch*); “L. Hunt’s farm,” *DA 11429*. REWA: Vicinity of Lami, *Parks 20932*. VANUA LEVU: THAKAUNDOVE: Navonu Creek, Natea Peninsula, *Howard 100*. TAVEUNI: *Seemann 120*. FIJI without further locality, *Horne 730, Howard 109*.

Dr. B. Verdcourt has kindly called to my attention the fact that Fijian material currently passing as *Mucuna platyphylla* actually represents two taxa. One of these, with comparatively short indument, cuspidate leaflet blade apices, and small bracts and bracteoles, may be taken as *M. platyphylla* in the sense of Gray’s type collection. The other, with longer indument, abruptly and sharply acuminate leaflet blade apices, and substantially larger bracts and bracteoles, seems indistinguishable from the New Guinean *M. stanleyi* C. T. White. A comparable situation exists in New Guinea, where *M. stanleyi* has often been confused with *M. albertisii* F. v. Muell., with which it may occasionally intergrade (cf. Verdcourt, *Man. New Guinea Leg.* 435, 437, 455. 1979). The two taxa of this relationship in Fiji seem further separable in minor characters of the fruits, as mentioned in the above key, although such data are derived from too few specimens to be accepted as entirely valid.

Various Polynesian specimens from the Society, Marquesas, and Austral Islands have been referred to *Mucuna platyphylla* (e. g. sensu F. Br. in *Bishop Mus. Bull.* 130:

115. 1935), but they do not represent the Fijian species. Some of them differ in having the indument of the leaflet blades closely sericeous and becoming sparse (rather than softly velutinous and persistent), the lateral blades more obviously asymmetrical and often narrower, and the bracts and bracteoles fugacious. Other eastern Polynesian specimens have foliar indument like that of *M. platyphylla* but bract and bracteole indument like that of the following species (*M. stanleyi*). Fruits of eastern Polynesian material often have steeply oblique lamellae (like those of *M. stanleyi*). Possibly two species of this alliance occur in eastern Polynesia, but the combinations of characters seen in the two Fijian species (*M. platyphylla* and *M. stanleyi*) are not present. The long stem and foliar indument and the large bracts and bracteoles that characterize *M. stanleyi* have not been noted in any of the eastern Polynesian specimens.

5. *Mucuna stanleyi* C. T. White in Proc. Roy. Soc. Queensland 34: 36. 1922; Verdcourt, Man. New Guinea Leg. 455. 1979. FIGURE 44A & B (seed only).

Mucuna stanleyi occurs at approximately the same elevations and in the same habitats as *M. platyphylla* and has in the past been confused with it, but closer examination shows that it differs in several dependable key characters. The vegetative and inflorescence indument is in large part composed of notably longer and somewhat paler hairs, the leaflet blades are more conspicuously and more sharply acuminate at apex, the bracts and bracteoles are conspicuously and consistently larger, and the fruits have the transverse lamellae oblique at a steeper angle (about 45–60°) from the horizontal. The available fruits of the two species are too few to permit a fully definitive comparison, but it appears that those of *M. stanleyi* are slightly the narrower and are less abruptly stipitate, with a tendency (at least in Fiji) to have the lower one or two seeds undeveloped.

TYPIFICATION: *Mucuna stanleyi* is based on C. T. White & E. R. Stanley 497 (BRI HOLOTYPE; ISOTYPE at K), collected in July or August, 1918, at Mafulu, alt. about 1,200 m., Papua New Guinea. (No collection number was indicated in the original publication, but the K sheet is marked "part of type".)

DISTRIBUTION: Papua New Guinea, including the Louisiade Archipelago and probably New Britain, and here first reported from Fiji, where it is known only from the two largest islands. The species has not been recorded from the Solomon Islands or the New Hebrides.

LOCAL NAMES: Fijian names each recorded only once have been *wandra* and *watikori* (Mba), *wanandrau* (Ra), *wambuto* (Tailevu), and *ngatiyaka* (Mbua).

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 254, 1288*; slopes of Mt. Nairoso, eastern flank of Mt. Evans Range, *Smith 4001*; slopes of the escarpment north of Nandarivatu, *Smith 6289*. NAMOSI: Wainivisoa Creek, near Navunikambi, Wainikoroiuva River, *DA 14990*. RA: Mountains near Penang, *Greenwood 254B*; vicinity of Nasukamai, *Gillespie 4387*. NAITASIRI: Between Viria and Naisonggo, *Parks 20473*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7030*. VANUA LEVU: MBUA: Southern portion of Seatovo Range, *Smith 1517*; lower Wainunu River Valley, *Smith 1734*.

29. *DIOCLEA* H. B. K. Nova Gen. et Sp. 6: ed. fol. 342 (July), ed. qu. 437 (Sept.). 1824; Hutchinson, Gen. Fl. Pl. I: 426. 1964; Verdcourt, Man. New Guinea Leg. 463. 1979; Maxwell in Ann. Missouri Bot. Gard. 67: 662. 1980.

Shrubs or lianas, often high-climbing, the stipules usually basally produced; leaves pinnately trifoliate, the stipels setaceous to filiform, the leaflet blades entire; inflorescences erect, axillary or borne on stems, often elongate, pseudoracemose, the flowers fasciculate on nodes, the bracts usually caducous; calyx with 2 caducous or persistent bracteoles, the tube campanulate, the 2 uppermost lobes partially connate, the lower-

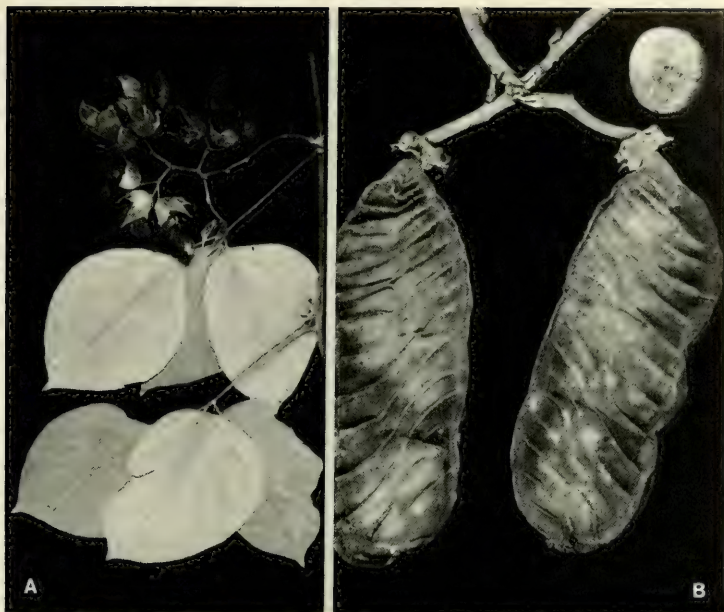


FIGURE 44. A & B (seed only), *Mucuna stanleyi*; A, distal portion of stem, with foliage and an inflorescence, $\times 1/4$; B (seed only), seed, $\times 1/2$. B (pods only), *Mucuna platyphylla*; mature fruits, $\times 1/2$. A from Smith 1734, B (pods) from Parks 20932, B (seed) from Gillespie 4387.

most lobe smaller than or subequal to the lateral lobes; petals blue to purple or paler, the standard orbicular to obovate, reflexed, auriculate at base of blade, the wings obovate or oblong, free, the keel petals incurved, subequal to wings, distally connate; stamens 10, the filaments of 9 connate into a tube, the vexillary filament free proximally but united in middle with the others, the anthers medifixed, linear, rarely uniform, usually the alternate ones smaller and sterile; ovary sessile or scarcely stipitate, villose, the ovules 2-several, the style incurved, thickened, glabrous distally, the stigma terminal, capitate; fruits subsessile above calyx scar, linear-oblong to semi-orbicular, somewhat compressed, coriaceous or woody, dehiscent or indehiscent, filled between seeds, the upper (dorsal) suture dilated or with a parallel wing or rib to either side, the lower suture dilated or with shallow ribs, the seeds large, compressed, oblong or suborbicular, hard, the hilum linear, usually encircling about $3/4$ the testa.

LECTOTYPE SPECIES: *Dioclea sericea* H. B. K. (vide Britton & Killip, Sci. Surv. Porto Rico, 418. 1924).

DISTRIBUTION: Pantropical, mostly American, with about 50 species. One species is indigenous in Fiji.

For advice on the disposition of the very incomplete but nevertheless intriguing collections here referred to *Dioclea* and *Macropsychnanthus* I am much indebted to B. Verdcourt, I. K. Ferguson, and R. H. Maxwell.

1. *Dioclea* sp.

FIGURE 45A&B.

Dioclea violacea sensu Seem. Fl. Vit. 57. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 152. 1890; Gibbs in J. Linn. Soc. Bot. 39: 144. 1909; J. W. Parham, Pl. Fiji Isl. 73. 1964, ed. 2. 112. 1972; non Mart. ex Benth.

The fallen fruit upon which this record is partially based is oblong, 2-seeded and slightly contracted between seeds, about 13×6 cm., slightly dilated but not winged along upper suture, apparently estipitate, and obtusely apiculate at apex. The seeds are chestnut-brown, large, $31-34 \times 27-29 \times 15-17$ mm., with the linear hilum encircling slightly more than $3/4$ the testa.

LOCAL NAME: *Wandra* was recorded by Gibbs; this not very informative name is used for many lianas.

AVAILABLE COLLECTIONS: VITI LEVU: NAMOSI: Plateau above waterfall near Namuamua, *Gillespie 2982* (BISH, a fallen fruit and 4 seeds only). NAITASIRI: Vatavula, Wainimala River, *Gibbs 509* (BM, flowers and young foliage). FIJI without further locality, *Williams* (BM, 3 leaflets only).

The fruit and seeds of *Gillespie 2982* represent the alliance of the predominantly Old World species of *Dioclea*, an alliance previously thought not to be indigenous in the Pacific east of Bougainville (cf. Verdcourt, Man. New Guinea Leg. 465. 1979). The Gibbs collection consists of detached parts (a leafy shoot, a separate inflorescence rachis, and two packets of flowers); its flowers and pollen (Verdcourt, Ferguson, in litt.) indicate that it is correctly referred to *Dioclea*. The three separate leaflets of *Williams* have thick petiolules about 4 mm. long, whereas the petiolules of *Gibbs 509* are more slender and about 7.5 mm. long. Although it seems fairly certain that all three collections came from indigenous plants, it cannot be positively stated that they all represent the same species. However, it is unlikely (although not impossible) that more than one indigenous *Dioclea* occurs in Fiji.

Thomas Williams was resident in Fiji between 1840 and 1853 and was often stationed at Somosomo, although these particular leaflets have not necessarily come from Taveuni. They do not form a very sound basis for Seemann's identification as "*Dioclea violacea*." However, that identification was based upon comparison with specimens from Hawaii and Tahiti; such specimens are now referred to *D. wilsonii* Standley, indigenous in tropical America. Apparently Gibbs was content to accept Seemann's opinion in identifying her no. 509.

Perhaps the taxon in Fiji is a form of *D. reflexa* Hook. f. or *D. javanica* Benth. (if the latter is considered distinct). It should be noted that drift seeds very similar to those of *Gillespie 2982* have been found in the Gilbert Islands (*Luomala 39, 41, 43*, all BISH). These seeds do not represent *D. wilsonii*, which is now known to occur in Hawaii and the Society and Austral Islands and is sometimes considered a naturalized escape from cultivation in those archipelagoes. However, at least one Hawaiian collection of *D. wilsonii* dates from 1825 (Verdcourt, in litt.), and so its natural occurrence from drift seeds there and in eastern Polynesia seems more likely than its naturalization from cultivated introductions (cf. also Maxwell in Ann. Missouri Bot. Gard. 67: 674. 1980). If this is the case, the cited Fijian collections do not indicate a new eastward indigenous extension of *Dioclea* in the Pacific, although they (and the drift seeds from the Gilbert Islands) may indeed suggest that the *D. reflexa*-*D. javanica* complex seems thus extended eastward.

30. MACROPSYCHANTHUS Harms in K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee, 399. 1900; Hutchinson, Gen. Fl. Pl. 1: 426. 1964; Verdcourt in Kew Bull. 32: 455. 1978, Man. New Guinea Leg. 466. 1979.

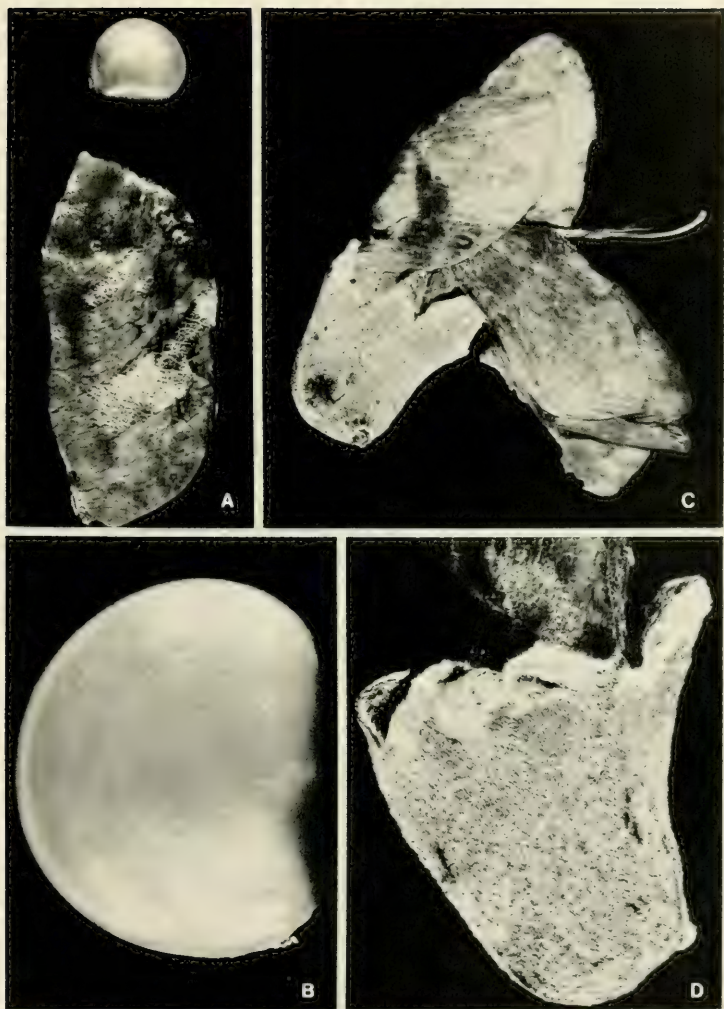


FIGURE 45. A & B, *Dioclea* sp.; A, fruit and seed, $\times 1/2$; B, seed, $\times 2$. C & D, *Macropsyчанthus lauterbachii* subsp. *parviflorus*; C, flower, $\times 2$; D, calyx, $\times 4$. A & B from Gillespie 2982. C & D from J. W. Parham, July 5, 1965.

A genus of high-climbing lianas closely allied to *Dioclea*, but differing in its cylindrical to campanulate, slightly asymmetrical calyx tube, which is conspicuously longer than the lobes; the lobes are clearly 5, the 2 upper ones being adnate only in bud and soon becoming completely separate. The petals are substantially longer than those of *Dioclea*, and the stamens are all fertile, although alternately longer and shorter and sometimes with caducous anthers. The fruits are obviously stipitate, with the upper suture neither dilated nor winged; seeds of the two genera appear to have an overlapping range of variability, although those of *Macropsychanthus* always have an elongated hilum.

TYPE SPECIES: *Macropsychanthus lauterbachii* Harms.

DISTRIBUTION: Talaud (Kepulauan) Island, Caroline Islands, and New Guinea eastward to the Solomon Islands, and here first recorded from Fiji, with three or more species.

1. ***Macropsychanthus lauterbachii* Harms subsp. *parviflorus* Verdcourt in Kew Bull. 32: 456. 1978, Man. New Guinea Leg. 469. 1979. FIGURE 45C & D.**

The genus is known in Fiji only from the inadequate collection cited below. Nevertheless, *Macropsychanthus* may be confidently recorded as occurring indigenously in Fiji. The mature (fallen) flowers from Taveuni seem indistinguishable from those of *M. lauterbachii* subsp. *parviflorus* (Verdcourt, in litt.), and their pollen agrees with that of the genus (Ferguson, in litt.). While the flowers should perhaps not be unequivocally assigned to this variety, their agreement with flowers from the Louisiades and Solomons is such that only further contradictory evidence could negate the identification.

TIPIFICATION: The type of *Macropsychanthus lauterbachii* subsp. *parviflorus* is Brass 28335 (K HOLOTYPE; ISOTYPES at L, LAE), collected at Abaleti, Rossel Island, Louisiade Archipelago, Papua New Guinea.

DISTRIBUTION: *Macropsychanthus lauterbachii* as a whole has been known from New Guinea and adjacent islands and the Solomon Islands. Subspecies *parviflorus* has hitherto been recorded only from Rossel Island and from New Georgia and San Cristobal in the Solomons.

AVAILABLE COLLECTION: TAVEUNI: Track to crater lake east of Somosomo, J. W. Parham, July 5, 1965 (BISH, 2 fallen flowers only); petals bright blue.

Although the available material of *Macropsychanthus* and *Dioclea* here discussed is far from satisfactory, both genera may now be recorded as indigenous in Fiji, and it is hoped that these notes will impel future collectors to search for such infrequently obtained high-climbing lianas.

31. CANAVALIA DC. Prodr. 2: 403. 1825; Seem. Fl. Vit. 58. 1865; Sauer in Brittonia 16: 113. 1964; Hutchinson, Gen. Fl. Pl. 1: 427. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Pabil. 571. 1971, Man. New Guinea Leg. 470. 1979. Nom. et orth. cons.

Canavali Adanson, Fam. Pl. 2: 325, 531. 1763. Orth. rejic.

Lianas, slender vines, or perennial herbs, a few species cultivated as annuals, the stems climbing or trailing, infrequently suberect, the stipules small, sometimes spurred and swollen beneath, deciduous; leaves pinnately trifoliolate, stipellate, the stipels usually minute and caducous; inflorescences pseudoracemose, the peduncle usually elongated, the rachis nodose, the bracts minute, the flowers borne in fascicles of 2-6, the bracteoles caducous; calyx 5-lobed, the lobes connate into 2 lips, the upper lip large, with 2 lobes united along upper edge, the lower lip much smaller, trifold; petals 5, showy, glabrous, clawed, auriculate at base of blade, the standard obovate, rounded, reflexed, sometimes slightly shorter than wings and keel petals, the wings narrow, free, falcate or somewhat twisted, the keel petals broader than wings, incurved, united near

apex; stamens 10, the filaments usually all connate into a tube, the vexillary filament free only near base or rarely entirely free, the anthers uniform; ovary stipitate, usually many-ovuled, the style incurved, the stigma small, terminal; fruits oblong to linear, compressed or inflated, dehiscent (sometimes tardily so) or not, the valves often winged or ribbed along ventral suture and sometimes (as in all our species) with an additional rib near sutural rib, (1-) 4-15-seeded, often thinly filled between seeds, the seeds ovoid to ellipsoid, compressed, the hilum linear, with a small, papery, persistent rim-aril.

TYPE SPECIES: *Canavalia ensiformis* (L.) DC. (*Dolichos ensiformis* L.). De Candolle did not intend to present a new name, but merely latinized Adanson's earlier name.

DISTRIBUTION: Pantropical and subtropical, with more than 50 species, principally concentrated in the New World. Some species, with buoyant and/or impermeable seeds, have very broad distributions. Five species are known from Fiji, four indigenous and one cultivated, all of them falling into subgen. *Canavalia* in Sauer's treatment (1964, cited below).

USEFUL TREATMENT OF GENUS: SAUER, J. Revision of *Canavalia*. *Brittonia* 16: 106-181. 1964.

KEY TO SPECIES

Petals not more than 3.5 cm. long; calyx at anthesis 11-14 mm. long, the upper lip shorter than the tube; fruits spirally dehiscent or indehiscent, the seeds 18-21 × 12-15 × 9-11 mm.; leaflet blades sparsely short-pilose, essentially glabrate.

Leaflet blades elliptic to ovate, up to 20 × 13 cm., obtuse to acuminate at apex; fruit valves with an additional rib 4-6 mm. from ventral rib.

Fruits compressed, 20-35 × 2.5-3.5 cm., spirally dehiscent, the seeds white, the hilum about half as long as seed, about 9 mm. long; upper calyx lip only slightly shorter than calyx tube; cultivated only, as a bushy, erect, annual herb. 1. *C. ensiformis*

Fruits inflated, 10-12 × 3-4.5 cm., indehiscent or tardily dehiscent, the seeds dark reddish brown, the hilum more than half as long as seed, 9-14 mm. long; upper calyx lip much shorter than calyx tube; indigenous vine, sometimes high-climbing. 2. *C. cathartica*

Leaflet blades elliptic to suborbicular, up to 12 × 11.5 cm., obtuse to emarginate at apex; upper calyx lip much shorter than calyx tube; fruits inflated, 11-15 × 2-2.7 cm., at length spirally dehiscent, the valves with an additional rib 2-3 mm. from ventral rib, the seeds brown, the hilum about half as long as seed, 7-12 mm. long; indigenous, littoral, trailing or weakly climbing vine. 3. *C. rosea*

Petals 4-6.2 cm. long; calyx at anthesis more than 15 mm. long, the upper lip as long as (or nearly as long as) the tube; fruits compressed, indehiscent or tardily dehiscent, the seeds 17-22 × 10-13 × 7-9 mm.; indigenous.

Leaflet blades suborbicular or broadly elliptic, 5-12 × 4-10 cm., obtuse to emarginate at apex, densely sericeous, especially beneath, with soft, long, white hairs; pedicel about 8 mm. long; calyx about 16 mm. long; standard about 4 cm. long; fruits pale brown, (6-) 10-16 × 2-3 cm., the valves with an additional rib 3-6 mm. from ventral rib, the seeds dark brown, the hilum about half as long as seed, 9-11 mm. long; littoral, prostrate or scrambling vine. 4. *C. sericea*

Leaflet blades ovate, 6-12 × 3.5-8 cm., acuminate or cuspidate to an obtuse tip 4-7 mm. long, sparsely pilose beneath but essentially glabrate; pedicel about 3 mm. long; calyx 18-23 mm. long; standard about 6 cm. long; fruits dark brown, 13-21 × 2.5-3.6 cm., the valves with an additional rib 5-8 mm. from ventral rib, the seeds reddish brown, the hilum more than half as long as seed, 15-18 mm. long; inland species, an often high-climbing liana. 5. *C. vitiensis*

1. *Canavalia ensiformis* (L.) DC. Prodr. 2: 404. 1825; Yuncker in Bishop Mus. Bull. 220: 148. 1959; Sauer in *Brittonia* 16: 142. fig. 2 (26), 12 (26). 1964; J. W. Parham, Pl. Fiji Isl. 72. 1964, ed. 2. 109. 1972; Purseglove, Trop. Crops, Dicot. 242. fig. 36. 1968; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 572. 1971; Smartt, Trop. Pulses, 57. fig. 2.6, 2.18 (5). 1976; Verdcourt, Man. New Guinea Leg. 473. 1979.

Dolichos ensiformis L. Sp. Pl. 725. 1753.

A bushy, erect, annual herb 1-2 m. high as occasionally cultivated near sea level in Fiji. The petals are pink to purple, the standard being 2.5-2.7 cm. long. Probably flowers and fruits may occur throughout the year.

TYPEFICTION: Sauer (1964) indicates as lectotype Sloane, Cat. Pl. Jam. 1: 68. *t.* 114, fig. 1-3. 1696. However, Verdcourt (1971) states that an actual specimen exists: *Sloane* (Herb. 3.67) (BM HOLOTYPE), from Spanish Town, Jamaica.

DISTRIBUTION: Central America and the West Indies. The species was a prehistoric American Indian domesticate as a food plant, now widely cultivated in tropical areas. It was probably a comparatively recent (within the past half century) introduction into Fiji.

LOCAL NAMES AND USES: The usual names, *sword bean* and *jack bean*, are applied in Fiji. The species is cultivated as a cover crop and green manure and is also considered a fodder plant. The young pods and immature seeds may be used as a vegetable.

AVAILABLE COLLECTION: VITI LEVU: TAILEVU: Nausori (Township Board compound), *DA* L.17093.

2. *Canavalia cathartica* Thou. in J. Bot. Agric. 1: 81, as *Canavalia catharticus*. 1813; Sauer in Brittonia 16: 158, fig. 2 (40), 12 (40), 19. 1964; St. John in Israel J. Bot. 19: 216. 1970; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 574, fig. 84. 1971; J. W. Parham, Pl. Fiji Isl. ed. 2. 109. 1972; Verdcourt, Man. New Guinea Leg. 471, fig. 111. 1979. FIGURE 46A.

Lablab microcarpus DC. Prodr. 2: 402. 1825.

Canavalia turgida Graham ex A. Gray, Bot. U. S. Expl. Exped. 1: 440. 1854; Seem. in Bonplandia 9: 255. 1861, Viti, 435. 1862, Fl. Vit. 59. 1865; Yuncker in Bishop Mus. Bull. 178: 65. 1943.

Canavalia obtusifolia sensu Seem. in Bonplandia 9: 255. 1861, Viti, 435. 1862, Fl. Vit. 58, p. p. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 153, p. p. 1890; non DC.

Canavalia ensiformis var. *turgida* Baker in Hook. f. Fl. Brit. Ind. 2: 196. 1876; Drake, Ill. Fl. Ins. Mar. Pac. 153. 1890.

Canavalia microcarpa Piper in Proc. Biol. Soc. Wash. 30: 176. 1917; Yuncker in Bishop Mus. Bull. 220: 148. 1959; J. W. Parham, Pl. Fiji Isl. 72. 1964.

A vine, sometimes high-climbing, found from near sea level to an elevation of about 400 m. in coastal or inland thickets, but not limited to littoral areas like *Canavalia rosea*. The inflorescences, up to 20 cm. long or more, bear fragrant flowers with pink to magenta petals, the wings and keel petals somewhat paler than the standard. Our material bore flowers between February and October, fruits between April and August.

LECTOTYPIFICATION AND NOMENCLATURE: Although apparently no specimens were preserved by Thouars, Verdcourt (1971, cited above) indicates the desirability of lectotypifying *Canavalia catharticus* by Thouars material from La Réunion rather than accepting Rheede, Hort. Ind. Malabar. 8: 87. *t.* 45. 1688, as the lectotype as suggested by Sauer (1964, cited above), because of the involvement of Rheede's illustration in the protologue of the basionym of *Canavalia virosa* (Roxb.) Wight & Arn. The lectotype of *Lablab microcarpus* selected by Sauer is *Cacara laut* Rumph. Herb. Amb. 5: 390. *t.* 141, fig. 1. 1747; for *C. turgida* he indicated *Wallich 5534a* (BM LECTOTYPE; ISOLECTOTYPES at C, G, K), collected in 1822 at Penang, Malaya. The three concepts are accepted as synonymous by all students of the genus.

DISTRIBUTION: Widespread from eastern Africa to India and the Ryukyu Islands and eastward through Malesia and into Polynesia, but only introduced and naturalized in Hawaii.

LOCAL NAME AND USE: In the Yasawas *wa tikuri* has been recorded, and there the stems are used for binding house frames.

AVAILABLE COLLECTIONS: YASAWAS: WAYA: Wailevu Creek, *St. John 18078*. VITI LEVU: MBA: Vicinity of Lautoka, *Greenwood 241A* (coll. *H. Phillips*), *241B*. NANDRONGA & NAVOSA: Thuvu, *Greenwood 241*. NAITASIRE: Mbatiki, Nanduruloulou, *DA 11751*, p. p. KANDAVU: Hills above Namalata and Ngaloa Bays, *Smith 192*. NGAU: Near Ngarani, *Tohill 112*. VANUA LEVU: THAKAUNDOVE: West of Valetih, *Bierhorst F100*. TAVEUNI: *Seemann 122*; Somosomo, *Seemann 112*. MOALA: *Bryan 337*. MATUKU:

Edge of forest, *Bryan 231*. **FULANGA:** *Bryan*, Aug. 6, 1924. **FII** without further locality, *U. S. Expl. Exped.*

3. **Canavalia rosea** (Sw.) DC. *Prodr.* 2:404. 1825; Christophersen in Bishop Mus. Bull. **128:** 104. 1935; Greenwood in Proc. Linn. Soc. **154:** 97. 1943; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 576. 1971, Man. New Guinea Leg. 475. 1979.

FIGURE 46B.

Dolichos maritimus Aubl. *Hist. Pl. Guiane Fr.* 765. 1775.

Dolichos obtusifolius Lam. *Encycl. Méth. Bot.* 2: 295, nom. illeg. 1786; non Jacq. (1768).

Dolichos roseus Sw. *Nov. Gen. & Sp. Prodr.* 105. 1788.

Canavalia maritima Thou. in *J. Bot. Agric.* 1: 80, as *Canavali maritimus*. 1813; Yuncker in Bishop Mus. Bull. **220:** 148. 1959; Sauer in *Brittonia* **16:** 163, fig. 2 (42), 12 (42), 21, 22. 1964; J. W. Parham, *Pl. Fiji Isl.* 72. 1964, ed. 2. 109. 1972; Sykes in *New Zealand Dept. Sci. Indust. Res. Bull.* **200:** 145. 1970; St. John & A. C. Sm. in *Pacific Sci.* **25:** 327. 1971; B. E. V. Parham in *New Zealand Dept. Sci. Indust. Res. Inform. Ser.* **85:** 38, 39, 141. 1972. (Non *Dolichos maritimus* Aubl.).

Canavalia obtusifolia DC. *Prodr.* 2: 404, nom. illeg. 1825; A. Gray, *Bot. U. S. Expl. Exped.* 1: 440. 1854; Seem. *Fl. Vit.* 58, p. 1865; Drake, *Ill. Fl. Ins. Mar. Pac.* 153, p. 1890; Guillaumin in *J. Arnold Arb.* **12:** 246. 1931; J. W. Parham in *Dept. Agr. Fiji Bull.* **35:** 93. 1959. (*Dolichos obtusifolius* Lam., non Jacq.).

A trailing or weakly climbing vine, occurring near sea level on beaches near high tide mark or in littoral thickets. The inflorescences, up to 20 cm. long, bear flowers with the standard pink to purple, yellowish proximally; the wings and keel petals are pale magenta. Flowers and fruits occur throughout the year.

TIPIFICATION AND NOMENCLATURE: *Dolichos maritimus* may be typified by *Phaseolus maritimus fructu duro* Plumier, *Nov. Gen. App.* 8. 1703. For *Dolichos obtusifolius* Lam. the lectotype (cf. Verdcourt, 1971, cited above) is a specimen from Santo Domingo, collector unknown (P). Cotypes of *Dolichos roseus* (cf. Verdcourt, 1971) are *Dolichos maritimus repens* P. Br. *Hist. Jam.* 293. 1756, and Swartz (BM SYNTYPE); no specimen found at s) from Jamaica. *Canavalia maritima* Thou. is best lectotypified (Verdcourt, 1971) by *Phaseolus maritimus purgans* Plukenet, *Phytographia*, t. 51, fig. 2. 1691.

The species has been widely known both as *Canavalia rosea* and as *C. maritima*, the nomenclature having been discussed by Sauer (1964) and Verdcourt (1971). A choice depends upon whether Thouars based his binomial *C. maritima* on the earlier *Dolichos maritimus* Aubl. or whether it is to be construed as a new name dating from 1813. The latter viewpoint would seem requisite, since Thouars did not actually cite the Aublet reference but did cite the Plukenet 1691 reference. Although the oldest binomial referable to the species is indeed *Dolichos maritimus* Aubl., the epithet is not available in *Canavalia* after 1813 because of *C. maritima* Thou. *Dolichos obtusifolius* Lam. is a later homonym of *D. obtusifolius* Jacq. and cannot serve as the basionym of the present taxon, for which the earliest available basionym is *D. roseus* Sw. Many additional synonyms of this species were discussed by Sauer (1964).

DISTRIBUTION: Worldwide, one of the commonest and most widespread seacoast plants in the tropics and subtropics. It sometimes hybridizes with *C. cathartica*.

LOCAL NAMES AND USE: *Ndralawa*, *ndrautolu*; in the Yasawas a concoction of leaves is said to be used after childbirth.

AVAILABLE COLLECTIONS: **YASAWAS:** YASAWA: Nambukeru Village, *Weiner 232*; Tamasua Village, *Weiner 232A*. **VITI LEVU:** MBA: Lautoka, *Greenwood 157*. **NANDRONGA & NAVOSA:** Vicinity of Singatoka, *Greenwood 157A* (coll. G. R. Robertson). **SERUA:** Serua road, *DA 9127*; Ndeumba Beach, *DA 11602*, *13000*; Navua, *Parks 20402*. **NAITASIRI** (presumably cult.): Plant Introduction and Quarantine Station, Nanduruloulou, *DA 8489*; Mbatiki, Nanduruloulou, *DA 11751*, p. p. **REWA:** Makuluva Island, *DA 11792*. **OVALAU:** *U. S. Expl. Exped. VANUA LEVU:* MBUA: Tomberua Island, *DA 11599*. **NAITAMBA:** *Tothill 114*. **FII** without further locality, *Parks "A"* (part of *Parks 20402?*).

4. *Canavalia sericea* A. Gray, Bot. U. S. Expl. Exped. 1: 440. 1854; Seem. Viti, 435. 1862, Fl. Vit. 58. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 153. 1890; Yuncker in Bishop Mus. Bull. 178: 65. 1943, in op. cit. 220: 149. 1959; Sauer in Brittonia 16: 171. fig. 2 (43), 12 (43), 23 (43). 1964; J. W. Parham, Pl. Fiji Isl. 72. 1964, ed. 2. 109. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 146. 1970.

FIGURE 46C.

Canavalia sericea var. *yunckeri* O. & I. Degener, Fl. Haw. Fam. 169c. 1960.

Canavalia sericea var. *yunckeri* f. *grandifoliolata* O. & I. Degener, Fl. Haw. Fam. 169c. 1960.

A prostrate or scrambling vine occurring near sea level on beaches, along rocky coasts, or in coastal thickets. The standard is bright or rich pink, the other petals slightly paler, and the filaments white. Flowers and fruits have been obtained between February and August but probably occur throughout the year.

TIPIFICATION: Type material was collected in 1840: *U. S. Expl. Exped.* (us 62795 HOLOTYPE; putative ISOTYPES at GH, K, NY, P), obtained from three localities in Fiji, Rewa Province (Viti Levu), Ovalau, and Direction Island (i. e. Namenalala, 17°06'S., 179°06'E., administratively part of Mbua Province, Vanua Levu, as discussed in this *Flora* 2: 695; this is only the second collection I have noted from the islet). Although the specimens do not bear precise localities, the us sheet should be considered the holotype (cf. this *Flora* 1: 40); Sauer (1964) had designated the GH specimen as lectotype. *Canavalia sericea* var. *yunckeri* is typified by *Yuncker 15050* (BISH LECTOTYPE; ISOLECTOTYPES at U, us, w), collected Feb. 26, 1953, near Vaina, Tongatapu, Tonga; f. *grandifoliolata* by *Yuncker 9889* (BISH LECTOTYPE; ISOLECTOTYPES at A, MICH), obtained Jan. 26, 1940, near Alofi, Niue. Intraspecific variation within this well-demarcated taxon seems inconsequential.

DISTRIBUTION: Micronesia, Queensland, and New Caledonia eastward to the Society and Austral Islands, introduced and sparingly naturalized in Hawaii.

LOCAL NAMES: The usual name is *ndralawa*; *wa vue* was noted on Koro.

AVAILABLE COLLECTIONS: MAMANUTHAS: NGGALITO Island, Malolo Group, O. & I. Degener 32213. VITI LEVU: NANDRONGA & NAVOSA: Thuvu, *Greenwood 273*. TAILEVU: Naingani Island, *DA 3364*. REWA: Nukulau Island, *Tohill 110A*. OVALAU: Vicinity of Thawathi, *Smith 8103*. KORO: East coast, *Smith 1093*. NAIRAI: *Tohill 110*. VANUA LEVU: MATHUATA: Beach near Lambasa, *Greenwood 273A*. YATHATA: *DA 15552*. VANUA MBALAVU: Near Sawana Village, *Garnock-Jones 1055*. NAVUTU-I-LOMA: *Bryan 403*, p. p. FULANGA: *Bryan 403*, p. p. ONGEA LEVU: *Bryan 403*, p. p. ONGEA NDIRIKI: *Bryan 403*, p. p. FIJI without further locality, *DA 5031*.

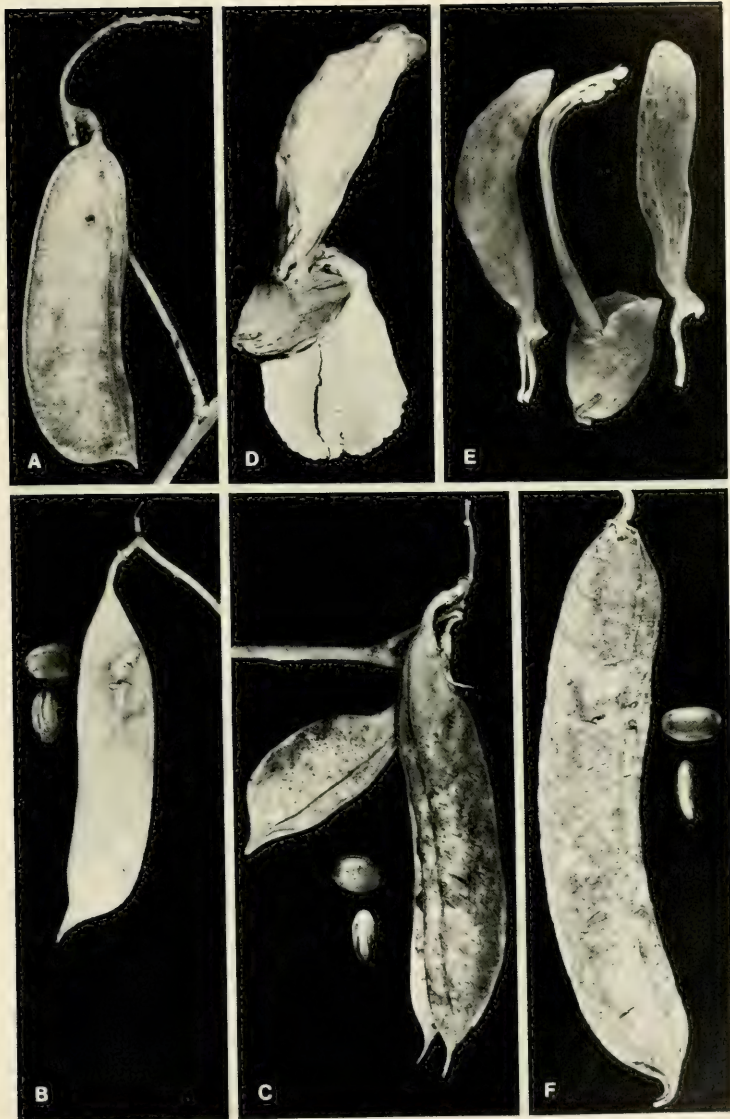
5. *Canavalia vitiensis* Sauer in Brittonia 16: 172. fig. 2 (44), 12 (44), 23 (44). 1964.

FIGURE 46D-F.

A sometimes high-climbing liana, sparingly found at elevations from 50 to 900 m. in thickets on forehills and in dense forest. The inflorescences, to 17 cm. long, bear the largest flowers of any Fijian species; the petals are rich to deep pink and the filaments white. Flowers have been collected in April and May; the only fruiting collection is not dated.

TIPIFICATION: The type is *Degener 15348* (A HOLOTYPE; ISOTYPES at BISH, K, MO, NY, UC, US), collected May 28, 1941, near Mataimeravula, vicinity of Rewasa, near Vaileka, Ra Province, Viti Levu.

FIGURE 46. A, *Canavalia cathartica*; fruit, $\times 1/2$. B, *Canavalia rosea*; fruit and seeds, $\times 1/2$. C, *Canavalia sericea*; fruits and seeds, $\times 1/2$. D-F, *Canavalia vitiensis*: D, flower, $\times 1$; E, calyx and staminal tube, keel petals, and a wing, $\times 1$; F, fruit and seeds, $\times 1/2$. A from *Bryan*, Aug. 6, 1924, B from *Parks 20402* (seeds from *Parks "A"*), C from *Bryan 403*, p. p. (Ongea Levu), D & E from *Smith 4053*, F from *Gillespie 4195*.



DISTRIBUTION: Endemic to Fiji and known with certainty only from Viti Levu and Vanua Levu.

LOCAL NAMES AND USE: The names *wa kori* and *wa korikori* have been recorded; in Ra the stems were used to bind timbers in house-building.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Slopes of Mt. Nairoso, eastern flank of Mt. Evans Range, *Smith 4053*. VANUA LEVU: MBUA: Naivakasinga region, *B. & H. Parham 4*. FIJI without further locality, *Gillespie 4195*.

32. *PACHYRHIZUS* L. C. Rich. ex DC. Prodr. 2: 402. 1825; Hutchinson, Gen. Fl. Pl. 1: 439. 1964; Verdcourt, Man. New Guinea Leg. 475. 1979. Nom. cons.

Tall climbing herbs with tuberous roots, the stipules lanceolate, the leaves pinnately trifoliolate, stipellate; inflorescences axillary, racemiform, the flowers borne in fascicles of 2-7 or on short branchlets, the bracts and bracteoles small, setaceous, caducous; calyx tube campanulate, 5-lobed, the 2 upper lobes connate into a bidentate lip; petals subequal in length, the standard broadly obovate, transversely appendaged within at base and with inflexed auricles at base of blade, the wings retrorsely appendaged, the keel petals incurved, obtuse; stamens with the vexillary filament free, the other filaments connate into a tube, the anthers uniform; ovary sessile, the ovules numerous, the style pilose, broadened distally and subinvolute, the stigma subglobose, lateral; fruits linear-oblong, compressed, dehiscent, depressed between seeds, these 4-12, ovoid to compressed-orbicular, the hilum small.

TYPE SPECIES: *Pachyrhizus angulatus* L. C. Rich. ex DC., nom. illeg. = *P. erosus* (L.) Urb. (*Dolichos erosus* L.). Typ. cons. The generic name has often been spelled with *-rrh-*, considered etymologically correct by students of classical Greek, but others consider the doubling of *rho* pedantic and unnecessary (e. g. R. W. Brown, *Composition of Scientific Words*, 19. 1956). In the present case, *Pachyrhizus* may perhaps be taken as the conserved orthography.

DISTRIBUTION: Tropical and subtropical America, with four or five species, of which one or two are now widely cultivated.

1. *Pachyrhizus erosus* (L.) Urb. Symb. Antill. 4: 311. 1905; Purseglove, Trop. Crops, Dicot. 281. fig. 43. 1968; Smartt, Trop. Pulses, 62. fig. 2.9. 1976; Verdcourt, Man. New Guinea Leg. 477. fig. 112. 1979; Henty in Papua New Guinea Dept. Forests Bull. 12: 90. fig. 54. 1980.

Dolichos erosus L. Sp. Pl. 726. 1753.

Pachyrhizus tuberosus sensu J. W. Parham, Pl. Fiji Isl. 75. 1964, ed. 2. 115. 1972; non Spreng.

A climbing or trailing herb, with turnip-shaped, often lobed tubers up to 30 cm. in diameter, occasionally cultivated near sea level. The leaflet blades are broadly ovate, angular or coarsely dentate, and up to 20 × 20 cm. The petals are blue to pale purple, the standard green-blotched at base or sometimes all white, and the fruits, up to 14 × 1.8 cm., have pale brown to blackish seeds up to 9 × 8 × 3.5 mm.

TYPIFICATION: The only reference of Linnaeus was: "*Pluk. alm.* 292. t. 54. f. 4."

DISTRIBUTION: Mexico and Central America, cultivated in pre-Columbian times and early taken to the Philippines and thence to Asia and Malesia, now widely cultivated in tropical areas.

LOCAL NAME AND USES: *Yam bean*; the tubers are edible raw or cooked, and the young pods are eaten as a cooked vegetable. Mature seeds and leaves contain a toxic substance.

Although no Fijian herbarium vouchers are available, *Pachyrhizus erosus* is the species cultivated in Pacific archipelagoes (e. g. Hawaii, Societies, Marianas, Carolines, New Guinea, Java) and was probably intended in Parham's references cited

above. The young pods of *P. tuberosus* (Lam.) Spreng. are not used as a vegetable because of irritant hairs, and this species is not widely established in the Old World; it has entire rather than coarsely dentate leaflet blades.

33. *CALOPOGONIUM* Desv. in Ann. Sci. Nat. 9: 423. 1826; Hutchinson, Gen. Fl. Pl. 1: 429. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 577. 1971, Man. New Guinea Leg. 480. 1979.

Climbing or trailing herbs, sometimes ligneous, the stipules small, ovate-lanceolate, caducous, the leaves pinnately trifoliolate, stipellate, the leaflet blades entire (as in our species) or lobulate; inflorescences axillary, pseudoracemose, long- or short-pedunculate or sessile, the flowers small, short-pedicellate, fasciculate in nodose clusters of 2-7, the bracts and bracteoles small, caducous; calyx campanulate, the lobes often subulate, the 2 upper ones separate or connate into a bidentate lip; petals blue to violet, clawed, auriculate at base of blade, the standard obovate, the wings narrow, adherent to keel, the keel petals shorter than wings; stamens with the vexillary filament free, the anthers uniform; ovary sessile, with few-many ovules, the style filiform, distally glabrous, the stigma terminal, capitate; fruits linear to oblong-linear, compressed, dehiscent, the valves transversely furrowed, septate between seeds, these orbicular-compressed or oblong, the hilum small.

TYPE SPECIES: *Calopogonium mucunoides* Desv.

DISTRIBUTION: Tropical and subtropical America, with 6-8 species, one of which is now widely distributed.

1. *Calopogonium mucunoides* Desv. in Ann. Sci. Nat. 9: 423. 1826; J. W. Parham, Pl. Fiji Isl. 72. 1964, ed. 2. 109. 1972; Purseglove, Trop. Crops, Dicot. 218. fig. 32, A. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 145. 1970; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 577. 1971, Man. New Guinea Leg. 481. fig. 114. 1979.

A sprawling or twining, perennial herb, cultivated from near sea level to an elevation of about 200 m. but apparently not naturalized. The stems, leaves, calyces, and fruits are densely pilose with spreading, ferruginous hairs. The leaflet blades are ovate to rhomboid, usually not much exceeding 8×6 cm., obtuse to apiculate-subacute at apex, and the short- to long-pedunculate inflorescences bear blue or purplish flowers, the standard sometimes with a proximal yellow blotch. Fruits are up to 40×5 mm., stiffly long-pilose, with 4-8 seeds about $3.5 \times 3 \times 2$ mm. Flowers and fruits are seen sporadically throughout the year.

TIPIFICATION: Desvaux indicated: "Hab. in Guianâ?", without mentioning a collector.

DISTRIBUTION: Tropical America, now cultivated and sometimes naturalized in other parts of the tropics.

LOCAL NAME AND USE: The name in widespread agricultural use is *calopo*. The species was introduced into Fiji in 1933 for use as a cover crop, but it does not seem to have become naturalized; it is rapidly growing but is not very palatable to cattle.

AVAILABLE COLLECTIONS: VITILEVU: MBA: Mba closed area, in trial plots, DA 14358 (FDA 16027). RA: Colonial Sugar Refining Co. Estate, Yanggara, DA 12310; District Farm, Ndombuilevu, DA 9513. NAITASIRI: Plant Introduction and Quarantine Station, Nanduruloulou, DA, Feb. 27, 1949; Mbatiki, Nanduruloulou, DA 2596; Koronivia Research Station, DA, Dec. 2, 1949. VANUA LEVU: MATHUATA: District Farm Northern, Seangangga, DA L.15606.

34. *PUERARIA* DC. in Ann. Sci. Nat. 4: 97. 1825; Hutchinson, Gen. Fl. Pl. 1: 426. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 594. 1971, Man. New Guinea Leg. 483. 1979.

Climbing or trailing perennial herbs, the roots sometimes tuberous, the stipules sometimes produced below point of insertion; leaves pinnately trifoliolate, stipellate, the leaflet blades ovate to rhomboid, entire or sinuate-lobed, usually pilose on both surfaces; inflorescences axillary, pseudoracemose or paniculate, often elongated, the rachis usually nodose, the bracts small, caducous, the flowers in fascicles of 3 or more, the bracteoles sometimes subpersistent; calyx tube campanulate, the 2 upper lobes connate into an entire or bidentate lip, the lowermost lobe the longest; petals small (in our species 1.5–2.5 cm. long), blue to purple, clawed, the standard rounded, with inflexed auricles, not appendaged, the wings narrowly oblong, often adherent to middle of keel, the keel petals subequal to wings, sometimes beaked; stamens with the vexillary filament free proximally, connate at middle with the filament tube of the others, rarely entirely free, the anthers uniform; ovary subsessile, linear, the ovules many, the style curved, proximally filiform, the stigma terminal, small, capitate; fruits elongated, narrow, compressed, filled or septate between seeds, dehiscent, the seeds many, compressed, suborbicular to subcylindric, the hilum small, central.

LECTOTYPE SPECIES: *Pueraria tuberosa* (Roxb. ex Willd.) DC. (*Hedysarum tuberosum* Roxb. ex Willd.) (vide Burkart, *Las Leguminosas Argentinas*, 544. 1943).

DISTRIBUTION: China and Japan to tropical Asia and Malaysia, extending eastward in the Pacific (but questionably indigenous east of western Melanesia), with about 20 species. Two species have been introduced into Fiji, one now copiously and the other rarely naturalized.

KEY TO SPECIES

- Roots greatly thickened, the tubers oblong-fusiform, up to 60 cm. or more long; stems with long, spreading hairs; stipules 1.5–2.5 cm. long, distinctly produced above and below point of insertion; stipels 10–20 mm. long; leaflet blades usually distinctly 3-lobed and conspicuously acuminate at apex, 10–18 (–35) × 8–15 (–30) cm.; bracteoles at base of calyx 4–7 mm. long, caducous; upper lip of calyx 7–10 mm. long, entire, acuminate; fruits up to 12 cm. long and 12 mm. broad, with a copious indument of spreading, ferruginous hairs. 1. *P. lobata*
- Roots not greatly thickened; stems with spreading or retrorse hairs; stipules about 1.5 cm. long, not produced below point of insertion; stipels 3–5 mm. long; leaflet blades entire or 3-lobed, acute to acuminate at apex, 5–12 (–20) × 4–11 (–15) cm.; bracteoles at base of calyx 1.5–3 mm. long, subpersistent; upper lip of calyx 2–3 mm. long, bidentate or emarginate; fruits 4–11 cm. long, 3–5 mm. broad, densely appressed-pilose. 2. *P. phaseoloides*

1. *Pueraria lobata* (Willd.) Ohwi in Bull. Tokyo Sci. Mus. no. 18: 16. 1947; Yuncker in Bishop Mus. Bull. 220: 147. 1959; Verdcourt in Taxon 17: 171. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 159. 1970; J. W. Parham, Pl. Fiji Isl. ed. 2. 117. 1972; St. John in Phytologia 36: 369. 1977; Verdcourt, Man. New Guinea Leg. 485. fig. 116. 1979.

Dolichos trilobus L. Sp. Pl. 726, p. p. 1753; Houtt. Nat. Hist. 10: 153. t. 64, fig. 1. 1779; non L. sensu typ. cons.

Dolichos hirsutus Thunb. in Trans. Linn. Soc. 2: 339. 1794; non *Pueraria hirsuta* Kurz (1874).

Dolichos lobatus Willd. Sp. Pl. 3: 1047. 1803.

Pachyrhizus thunbergianus Sieb. & Zucc. in Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4: 237. 1846.

Pueraria thunbergiana Benth. in J. Linn. Soc. Bot. 9: 122. 1865; Guillaumin in J. Arnold Arb. 12: 245. 1931; Christophersen in Bishop Mus. Bull. 128: 104. 1935; A. C. Sm. in Sargentia 1: 39. 1942, in Bull. Torrey Bot. Club 70: 541. 1943; Yuncker in Bishop Mus. Bull. 178: 65. 1943; J. W. Parham, Pl. Fiji Isl. 76. 1964.

Pachyrhizus trilobus sensu Seem. Fl. Vit. 63. 1865; Horne, A Year in Fiji, 265. 1881; Drake, Ill. Fl. Ins. Mar. Pac. 155. 1890; Guppy, Obs. Nat. Pac. 2: 412, 413. 1906; Gibbs in J. Linn. Soc. Bot. 39: 209. 1909; non DC.

Pachyrhizus angulatus sensu Seem. in Bonplandia 9: 255. 1861; Horne, A Year in Fiji, 86. 1881; non A. Rich.

Pueraria triloba Makino in Inuma, Somoku-Dzusesetsu, ed. 3. 954, 13: t. 22. 1912; non sensu *Dolichos trilobus* L. sensu typ. cons.

A sprawling, scrambling, or twining vine with subligneous stems, abundantly naturalized on dry hillsides, in grassland and thickets, and along roadsides at elevations from near sea level to about 400 m. The petals vary from purple or rich blue to pink, the standard being slightly paler and marked with yellow within; the filaments and style are nearly white. Although many collections are sterile, flowers are seen between November and July. Fruits seem not to occur in Fiji, as previously noted by Guppy (1906, cited above).

TYPIFICATION AND NOMENCLATURE: The complex synonymy concerning this species was clarified by Verdcourt (in *Taxon* **17**: 170–173. 1968), *Dolichos trilobus* L. being typified in a way that excludes the present concept and permits that binomial to be applied to the conserved type species of the genus *Dolichos*. *Dolichos hirsutus* was based on Kämpfer, *Icon. Select. Pl. pl. 41*. 1791, but the binomial based on it, *Pueraria hirsuta* Schneider, is a later homonym of *P. hirsuta* Kurz. *Dolichos lobatus* is based on Panzer's edition of Houtt. *Nat. Hist.* **8**: 560. *t. 64, fig. 1*. 1782, and thus on Houttuyn's concept of *D. trilobus* L. (*Nat. Hist.* **10**: 153. *t. 64, fig. 1*. 1779). *Pachyrhizus thunbergianus*, like *Dolichos hirsutus*, is typified by Kämpfer's 1791 illustration.

DISTRIBUTION: Southeastern Asia from India, China, and Japan perhaps into Malesia, now widely naturalized elsewhere. About 20 Fijian collections have been seen, but the species is very abundant in scattered localities.

LOCAL NAMES AND USES: Fijian names are *yaka*, *wa yaka*, and *nggariaka*; *kudzu* is also used. The *yaka* seems very probably to have been an aboriginal introduction, its tubers providing a well-known emergency food, edible when cooked like yams but insipid and much inferior. The stems can be used for tying temporary bundles. As *kudzu*, the species has been more recently introduced and cultivated to produce green and dry food for livestock.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Hills inland from Lautoka, *Greenwood 161*; Korovou, east of Tavua, *Degener 14942*. SERUA: Hills between Wainiggere and Waisese Creeks, between Ngaloa and Wainiyambia, *Smith 9668*. RA: Hills near Penang, *Greenwood 161A*. NAITASIRE: Vunimbua hills, vicinity of Nanduruloulou, *DA 5629*; Mbatiki Model Farm, Nanduruloulou, *DA 11746*; Nasinu, Tongawangga, *DA 10791*. TAILEVU: Naingani Island, *DA 3371*. VANUA LEVU: MATHUATA: *Seemann 114*; Nggaraningoli Creek, Ndreketi River, *DA 13909*. THAKAUNDROVE: Along Hibiscus Highway east of Savasavu, *Bierhorst F167*. TAVEUNI: Vicinity of Waiyevo, *Gillespie 4703*. LAKEMBA: Nukunuku Village, *Garnock-Jones 823*. KAMBARA: On limestone formation, *Smith 1268*.

2. *Pueraria phaseoloides* (Roxb.) Benth. in *J. Linn. Soc. Bot.* **9**: 125. 1865; J. W. Parham, *Pl. Fiji Isl.* **76**. 1964, ed. 2. 117. 1972; Purselglove, *Trop. Crops, Dicot.* **218, fig. 33, A**. 1968; Sykes in *New Zealand Dept. Sci. Indust. Res. Bull.* **200**: 159. 1970; Verdcourt in *Fl. Trop. E. Afr. Leg. Papil.* **596, fig. 87 (var. javanica)**. 1971, *Man. New Guinea Leg.* **485, fig. 115 (var. javanica)**. 1979.

Dolichos phaseoloides Roxb. *Fl. Ind.* ed. 2. **3**: 316. 1832.

A climbing or trailing herb, often forming tangled mats, cultivated at elevations between sea level and about 200 m., and perhaps very sparingly naturalized on open hillsides near experimental plots. The petals are mauve to blue or pink, the standard being greenish without. Flowers and fruits have been collected between June and August.

TYPIFICATION: Described from plants grown at Calcutta from seeds sent from Canton, China, by Kerr, and represented by Roxburgh drawing no. 1890 (K, SYNTYPE, cf. Verdcourt, 1971, cited above).

DISTRIBUTION: Southeastern Asia and Malesia, now widely cultivated and doubtless naturalized elsewhere. In Fiji it has scarcely become naturalized.

LOCAL NAMES AND USES: The *tropical kudzu* or *puero* was introduced into Fiji in 1943, and various subsequent introductions have been made. The species is used as a cover crop and green manure, as well as a fodder and pasture plant.

AVAILABLE COLLECTIONS: VITI LEVU: NADRONGA & NAVOSA: Agricultural Station, Nathotholevu, near Singatoka, DA 6001, 8304. NAITASIRE: Plant Introduction and Quarantine Station, Nanduruloulou, DA. Feb. 27, 1949, Dec. 28, 1951, 8487 (FDA 13471); Principal Agricultural Station, Koronivia, DA, Dec. 2, 1949. VANUA LEVU: MATHUATA: District Farm Northern, Seangangga, DA 16682, L.15607.

It is not clear whether the strain cultivated in Fiji represents var. *phaseoloides* or var. *javanica* (Benth.) Baker (in Hook. f. Fl. Brit. Ind. 2: 199. 1876, based on *Neustanthus javanicus* Benth. in Miq. Pl. Junghuhn. 235. 1852), which is said to be the more robust variety and to have short, blunt calyx lobes; the two varieties do not seem sharply separable.

35. GLYCINE Willd. Sp. Pl. 3: 1053. 1802; Hermann in U. S. Dept. Agr. Tech. Bull. 1268: 9. 1962; Hutchinson, Gen. Fl. Pl. 1: 449. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 528. 1971, Man. New Guinea Leg. 490. 1979. Nom. cons., non *Glycine* L. (1753), nom. rejic.

Soia Moench, Meth. Pl. 153. 1794. Nom. rejic. prop. (vide Lackey in Taxon 27: 560. 1978).

Procumbent or twining perennial herbs (one species erect and annual), the stipules small, deciduous; leaves pinnately (or in some species digitately) trifoliolate, stipellate, the leaflet blades entire; inflorescences axillary, racemose, rarely terminal and paniculate or fasciculate, the bracts small, the flowers small, solitary at inflorescence nodes, the pedicels short, with subsistent apical bracteoles; calyx subbilabiate, 5-lobed, the 2 upper lobes partially connate; petals long-clawed, glabrous, the standard suborbicular or obovate to rhomboid, slightly auriculate at base, the wings narrow, somewhat adherent to keel, the keel petals much shorter than wings; stamens 10, monadelphous or the vexillary filament at length becoming free, the anthers uniform; ovary sessile, the ovules few-several, the style short, slightly incurved, glabrous, the stigma small, terminal, capitate; fruits linear or oblong, subcylindric or compressed, straight or falcate, thinly septate between seeds, dehiscent, the seeds ovoid-oblong to subglobose, the hilum short, lateral.

TYPE SPECIES: *Glycine clandestina* Wendl. (vide Verdcourt in Taxon 15: 35. 1966). All eight of the species originally referred to *Glycine* by Linnaeus are now considered members of other genera. As Verdcourt has indicated, the only reasonable way to preserve the generic name *Glycine* in its current sense, including the economically important soybean, is to conserve it from Willdenow's 1802 usage.

DISTRIBUTION: Siberia and Japan to Australia and eastward in the Pacific to Fiji and Tonga, with nine species. Two species occur in Fiji, one indigenous and one cultivated.

USEFUL TREATMENTS OF GENUS: HERMANN, F. J. A revision of the genus *Glycine* and its immediate allies. U. S. Dept. Agr. Tech. Bull. 1268: 1-79. 1962. NEWELL, C. A., & T. HYMOWITZ. A reappraisal of the subgenus *Glycine*. Amer. J. Bot. 65: 168-179. 1978. NEWELL, C. A., & T. HYMOWITZ. A taxonomic revision in the genus *Glycine* subgenus *Glycine* (Leguminosae). Brittonia 32: 63-69. 1980. HYMOWITZ, T., & C. A. NEWELL. Taxonomy of the genus *Glycine*, domestication and uses of soybeans. Econ. Bot. 35: 272-288. 1981.

KEY TO SPECIES

Twining or procumbent perennial herb, with short, often sparse, usually appressed, whitish hairs on stems, leaves, inflorescences, and fruits; leaflet blades obovate to elliptic-lanceolate or oblong-linear, usually (as seen in Fijian Region) 1.5-3 × 1-2 cm.; inflorescences loosely racemose, 5-10 (-18) cm. long; fruits variable, curved and slender to stout and straight, usually 2-3 cm. long and 2-4 mm. broad; indigenous.

1. *G. tabacina*

Erect annual herb, with obvious, spreading, usually yellowish brown hairs on stems, leaves, inflorescences, and fruits; leaflet blades ovate or elliptic, 3–10(–15) × 2–6(–10) cm.; inflorescences often congested, 1–5 cm. long; fruits oblong, slightly falcate, 2.5–8 cm. long, 8–15 mm. broad; cultivated. . . . 2. *G. max*

1. ***Glycine tabacina*** (Labill.) Benth. ex Seem. in A. Gray in *Bonplandia* **10**: 35, nom. illeg. 1862; Benth. ex Seem. Viti, 435, nom. illeg. 1862; Benth. *Fl. Austral.* **2**: 244. 1864; Seem. *Fl. Vit.* **57**. 1865; Drake, Ill. *Fl. Ins. Mar. Pac.* **151**. 1890; Yuncker in *Bishop Mus. Bull.* **220**: 145. 1959; J. W. Parham, *Pl. Fiji Isl.* **74**. 1964, ed. 2. **113**. 1972; Sykes in *New Zealand Dept. Sci. Indust. Res. Bull.* **200**: 155. 1970; Newell & Hymowitz in *Amer. J. Bot.* **65**: 170. *fig. 16–18*. 1978.

Kennedia tabacina Labill. *Sert. Austro-Caled.* **70**. *t.* **70**. 1825.

Rhynchosia minima sensu Seem. in *Bonplandia* **9**: 255. 1861; non DC.

"*Hedysarea*" A. Gray in *Proc. Amer. Acad. Arts* **5**: 317. 1862.

Galactia tenuiflora sensu Yuncker in *Bishop Mus. Bull.* **220**: 147. 1959; non Wight & Arn.

A twining or procumbent perennial herb with usually creeping or trailing stems, infrequently occurring near sea level and presumably in more or less open and dry habitats. The petals are mauve-blue to dark reddish purple, 5–7 mm. long, the standard white proximally.

TYPIFICATION: The type is a Labillardière collection (HOLOTYPE probably at FI) from New Caledonia.

DISTRIBUTION: Australia (diploid); the tetraploid form has spread north to southern China, Taiwan, and the Ryukyu Islands and also eastward in the Pacific to Micronesia, New Caledonia, the New Hebrides, Fiji, and Tonga. Hymowitz (in conversation) suggests that its occurrence in Niue and Samoa (Sykes, 1970, cited above) results from accidental introductions. Although doubtless indigenous in Fiji, the species must be extremely infrequent there, whereas in Tonga it is known from at least three islands and five or six collections.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Vicinity of Singatoka, *Greenwood 769* (K). VANUA LEVU: MATHUATA: Nukumbati Island, off Mathuata coast (at long. 179°02'E.), *Seemann 123* (K).

2. ***Glycine max*** (L.) Merr. *Interpret. Rumph. Herb. Amb.* **274**. 1917; Hermann in *U. S. Dept. Agr. Tech. Bull.* **1268**: 39. 1962; J. W. Parham, *Pl. Fiji Isl.* **74**. 1964, ed. 2. **113**. 1972; Purselove, *Trop. Crops, Dicot.* **265**. *fig. 41*. 1968; Verdcourt in *Kew Bull.* **24**: 256. 1970; Smartt, *Trop. Pulses*, **21**, 59. *fig. 2.7, 2.18 (4)*. 1976; Verdcourt, *Man. New Guinea Leg.* **492**. 1979.

Phaseolus max L. *Sp. Pl.* **725**. 1753.

An erect annual herb 0.5–1.8 m. high, occasionally cultivated near sea level. The petals are white to pink or lilac, and the seeds are greenish yellow to blackish, 6–10 × 5–8 mm.

TYPIFICATION: Although Merrill in 1917 provided a full discussion and an extensive synonymy, he did not indicate a lectotype among the references mentioned by Linnaeus.

DISTRIBUTION: *Glycine max* is considered a cultigen derived from its wild relative *G. soja* Sieb. & Zucc., indigenous in eastern Asia, and presumably domesticated in China as early as 1700 B. C. or earlier (Hymowitz and Newell, 1981, cited above). It spread into adjacent parts of the Old World and is now a worldwide crop plant of major importance. Its introduction into Fiji, however, was presumably recent and its cultivation there is very limited; no herbarium vouchers are available.

LOCAL NAMES AND USES: The usual names *soybean* and *soya bean* are utilized in Fiji. Seeds of the soybean are very rich in protein, providing one of the world's most important sources of oil and protein. The newly germinated seeds are used in cooking as "bean sprouts," and many protein-rich foods and sauces are made from the seeds. The oil is widely used industrially for a variety of purposes. Valuable comments on the uses and history of the soybean are detailed by Burkill (Dict. Econ. Prod. Malay Penins. ed. 2. 1098-1103. 1966) and by Purseglove (1968), Smartt (1976), and Hymowitz and Newell (1981), cited above.

36. *NEONOTONIA* Lackey in *Phytologia* 37: 210. 1977.

Notonia Arn. in Wight & Arn. Prodr. Fl. Ind. Orient. 207. 1834; non DC. (1833).

Johnia Arn. in Wight & Arn. Prodr. Fl. Ind. Orient. 449. 1834; non Roxb. (1832).

Glycine subgen. *Bracteata* Verdcourt in *Taxon* 15: 36. 1966.

A monotypic genus distinguished from *Glycine* by its pseudoracemose inflorescence and its calyx with the 2 upper lobes completely united; inflorescences many-flowered, the flowers 3 or more per node, each fascicle subtended by a bract and each flower by secondary bracts, the pedicels short, with 2 bracteoles at base of calyx; calyx tube short, the lobes linear-lanceolate; leaves pinnately trifoliolate.

TYPE SPECIES: *Neonotonia wightii* (Arn. in Wight & Arn.) Lackey (*Notonia wightii* Arn. in Wight & Arn.).

DISTRIBUTION: Southeastern Asia (India and Ceylon to Java) and tropical Africa from Ethiopia to Angola and South Africa, with a single species, which is now widely cultivated elsewhere.

1. *Neonotonia wightii* (Arn. in Wight & Arn.) Lackey in *Phytologia* 37: 210. 1977.

Notonia wightii Arn. in Wight & Arn. Prodr. Fl. Ind. Orient. 208. 1834.

Johnia wightii Arn. in Wight & Arn. Prodr. Fl. Ind. Orient. 449. 1834.

Glycine wightii Verdcourt in *Taxon* 15: 35. 1966, in *Fl. Trop. E. Afr. Leg. Papil.* 528. fig. 79. 1971; J. W. Parham, *Pl. Fiji Isl.* ed. 2. 113. 1972; Verdcourt, *Man. New Guinea Leg.* 493. 1979.

Glycine javanica sensu auct. mult. (cf. Verdcourt in *Taxon* 15: 35. 1966); non L.

Desmodium sandwicense sensu J. W. Parham, *Pl. Fiji Isl.* ed. 2. 112. 1972; non E. Meyer.

A perennial climbing or trailing herb 0.5-4.5 m. long, often woody at base and with the rootstock sometimes thick and woody, cultivated only (or perhaps sparingly naturalized) near sea level. The leaflet blades are ovate to elliptic, variable in size but as noted in Fiji (2.5-) 3-7 × (1.5-) 2-5 cm., shortly soft-pilose and subglabrate on both surfaces. The inflorescences are variable in length but usually not much exceeding 30 cm.; the pedicels are usually 1-3 mm. long, the bracts and bracteoles linear to lanceolate, the primary bracts to 9 mm. long, the secondary bracts and bracteoles to 5 mm. long. The calyx lobes are up to 6 mm. long, the standard up to 11 mm. long (about 5-7 mm. long in our collections), white without, bluish within or with a mauve blotch, often turning orange-red with age, the wings and keel petals white or tinged with mauve. The fruits are linear-oblong, usually 2-3.5 cm. long and 3-5 mm. broad, with reddish or orange-brown seeds.

TYPIFICATION: Verdcourt (1971, cited above) lists as syntypes three collections from southern India: *Wight* 871 (κ), 872 (κ), and *Heyne* in Wallich Cat. No. 5528 (κ).

DISTRIBUTION: As of the genus.

USES: A pasture legume, with very high nitrogen production, widely used throughout the tropics as fodder and often mixed with pasture grasses. It is a comparatively recent introduction into Fiji (usually brought in as *Glycine javanica* and at least once as *Desmodium sandwicense*). It has probably become naturalized, although the only available vouchers are all from trial plots.

AVAILABLE COLLECTIONS: VITI LEVU: Mba: Mba closed area, DA 13183 (FDA 15417), 14356 (FDA 16020). NANDRONGA & NAVOSA: Agricultural Station, Nathotholevu, near Singatoka, DA 9786, 10837. NAITASIRE: Plant Introduction and Quarantine Station, Nanduruloulou, DA 9463 (FDA 14350), 9465.

In Taxon 15: 36. 1966, and in Fl. Trop. E. Afr. Leg. Papil. 529-533. 1971, Verdcourt discusses three subspecies of *Glycine wightii*, two of them with varieties. The typical subspecies *wightii* is the one that occurs in Fiji. Of the two varieties of this subspecies recognized by Verdcourt, he suggests (1979, cited above) that var. *longicauda* has been introduced into the Pacific area, but different introductions into Fiji appear to represent both varieties of the subspecies. I have not noted transfer of infraspecific taxa to the genus *Neonotonia*.

37. TERAMNUS P. Br. Hist. Jam. 290. 1756; Hutchinson, Gen. Fl. Pl. 1: 451. 1964; Verdcourt in Kew Bull. 24: 263. 1970, in Fl. Trop. E. Afr. Leg. Papil. 533. 1971, Man. New Guinea Leg. 496. 1979.

Perennial herbs, usually trailing or climbing (rarely low shrubs), the stipules small; leaves pinnately trifoliolate, stipellate, the leaflet blades entire; inflorescences axillary, pseudoracemose or fasciculate, the flowers small, paired or clustered, the bracts small, the bracteoles linear or lanceolate, subsistent; calyx 4- or 5-lobed, the 2 upper lobes free or united; petals glabrous, the standard obovate, not auriculate or appendaged, the wings narrow, long-clawed, adherent to keel, the keel petals shorter than wings; stamens monadelphous or the vexillary filament free, the alternate anthers small and sterile or lacking; ovary sessile, linear, the ovules many, the style short, thick, sometimes obscured by tufted hairs, the stigma capitate; fruits linear, with a sharply bent apical hook formed by the accrescent style base, septate between seeds, dehiscent, the seeds ovoid or ellipsoid, the hilum short, lateral.

LECTOTYPE SPECIES: *Teramnus volubilis* Sw. (vide Britton & Wilson, Sci. Surv. Porto Rico 5: 413. 1924).

DISTRIBUTION: Pantropical and subtropical, with eight species, one of which has become naturalized in Fiji.

1. *Teramnus labialis* (L. f.) Spreng. Syst. Veg. 3: 235. 1826; Verdcourt in Kew Bull. 24: 266. 1970, in Fl. Trop. E. Afr. Leg. Papil. 535. fig. 80 (1-12, 14) (sens. lat.). 1971; J. W. Parham, Pl. Fiji Isl. ed. 2. 119. 1972; Verdcourt, Man. New Guinea Leg. 496. fig. 119. 1979.

Glycine labialis L. f. Suppl. Pl. 325. 1782.

A climbing, trailing, or prostrate herb, cultivated or naturalized near sea level. The slender stems are pilose with subappressed white hairs. In Pacific material the leaflet blades are narrowly elliptic to ovate, 2.5-7 × 1-3.5 cm., rounded to subacute and minutely apiculate at apex, essentially glabrous above, and appressed-white-pilose beneath. The inflorescences may become 10 cm. long, the calyx being appressed-pilose and with lanceolate lobes to 3 mm. long; the standard is 4-5 mm. long, white to purplish, drying orange, the wings pale mauve, and the keel petals white. Fruits are 3.5-6 cm. long and 2.5-4 mm. broad, appressed-pilose but glabrate, with a terminal hook to 3 mm. long; the seeds are smooth, chestnut-brown, and up to 3 × 2 × 1.5 mm.

TIPIFICATION: Verdcourt (1970, cited above) indicated as LECTOTYPE Herb. Linnaeus 901.15 (LINN), grown at Uppsala from seed from India.

DISTRIBUTION: The species as a whole occurs from southeastern Asia into Malesia and also in tropical and South Africa. In Verdcourt's key (1970) to the species and infraspecific taxa of *Teramnus*, the Fijian (and perhaps all the Pacific) material falls into subsp. *labialis* var. *labialis*, which is indigenous in the northern part of the range of the species. It is also recorded from Guam, Madagascar, and Rodrigues (Verdcourt,

1970), but at least on Guam it may be a naturalized escape from cultivation.

USE: A comparatively recent introduction into Fiji (probably in the 1930's), presumably as a potential pasture legume, and locally naturalized as a weed.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Plant Introduction and Quarantine Station, Nanduloulou, DA 9465. REWA: Suva, as a common weed on roadside, DA 2486.

38. *CENTROSEMA* Benth. Comment. Leg. Gen. 53. 1837; Hutchinson, Gen. Fl. Pl. 1:446. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 518. 1971, Man. New Guinea Leg. 499. 1979. Nom. cons.

Prostrate or climbing herbs or low shrubs, the indument of fine, minutely uncinat hairs, the stipules persistent; leaves pinnately trifoliolate (as in our species) or sometimes 1-, 5-, or 7-foliolate (rarely digitately 3- or 5-foliolate), stipellate; inflorescences axillary, pseudoracemose, with (1-) few-many flowers, these showy, 1 or 2 in bract axils, the bracts paired, usually persistent, the upper ones united, the bracteoles appressed to calyx, striate; calyx tube campanulate, the 2 upper lobes united into a bifid or emarginate lip; petals white to violet, the standard the longest, broadly orbicular, short-spurred or rarely tuberculate dorsally near base above the short claw, the keel petals broad, nearly as long as wings; stamens with the vexillary filament free or loosely connate with the others, the anthers uniform; ovary subsessile, linear, with many ovules, the style incurved, distally compressed and bearded, the stigma terminal; fruits linear, compressed, with 4 prominent ribs or wings near sutures, dehiscent, the style base often persistent as a beak, the seeds oblong or subglobose, compressed, the hilum small.

TYPE SPECIES: *Centrosema brasilianum* (L.) Benth. (*Clitoria brasiliiana* L.). Typ. cons.

DISTRIBUTION: Tropical and subtropical America, with about 45 species, some of which are cultivated and sometimes naturalized elsewhere. One species has been introduced into Fiji and has become naturalized.

1. *Centrosema pubescens* Benth. Comment. Leg. Gen. 55. 1837; J. W. Parham, Pl. Fiji Isl. 72. 1964, ed. 2. 110. 1972; Purseglove, Trop. Crops, Dicot. 218. fig. 32, B. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 147. 1970; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 520. fig. 76. 1971, Man. New Guinea Leg. 501. fig. 122. 1979.

A climbing or prostrate herb, often forming tangled mats, introduced and now also naturalized near sea level along roadsides, in waste places, on river banks, and on coconut plantations. The stems are slender and pilose, the leaflet blades oblong to ovate, 3-9 × 1.5-5 cm., short-pilose but glabrate on both sides. The compact inflorescences are several-flowered, the standard being blue to purple with darker veins and yellow-tinged, up to 4 × 3 cm., pubescent without, and with a spur scarcely 1 mm. long. The fruits, up to 17 cm. long and 7 mm. broad, are ribbed near the sutures, with numerous (often about 20) seeds up to 5 × 3 × 2 mm. and red-brown with black streaks. Flowers and fruits have been noted between May and September.

TIPIFICATION: The type is *Keerle* in Herb. Martius (M HOLOTYPE), obtained near Talpuxahua, Mexico.

DISTRIBUTION: Tropical America, now widely cultivated and often naturalized. About 15 Fijian collections have been examined.

LOCAL NAMES AND USES: *Centro* is commonly applied to the cultivated introductions; the only Fijian name noted is *pi ni ndola* (Lakemba). The species was introduced as a cover crop and fodder plant in the middle 1930's, and as elsewhere is a widely used pasture legume.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mba closed area, *DA 14348*. NANDRONGA & NAVOSA: Agricultural Station, Nathoholevu, near Singatoka, *DA 11312*. RA: Pasture Seed and Production Farm, Ndombuilevu, *DA 9519*. NAITASIRI: Plant Introduction and Quarantine Station, Nanduruloulou, *DA 8485*; Principal Agricultural Station, Koronivia, *DA 12130*. TAILEVU: Between Mburetu and Ndaku, *DA 870*. VANUA LEVU: MATHUATA: District Farm Northern, Seangangga, *DA L.15608*. NAITAMBA: *DA 9645*. LAKEMBA: Near Tumbou, *Garnock-Jones 879*.

39. *CLITORIA* L. Sp. Pl. 753. 1753; Hutchinson, Gen. Fl. Pl. 1: 446. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 515. 1971, Man. New Guinea Leg. 501. 1979.

Shrubs or herbs, sometimes climbing, or rarely trees, the indument of fine, minutely uncinuate hairs, the stipules striate, persistent; leaves pinnately 3–9-foliolate, rarely 1-foliolate, stipellate; inflorescences axillary (or on old branches), racemose or 1- or 2-flowered, the flowers showy, resupinate, the bracts paired, the upper ones united, the pedicels often paired, the bracteoles at base of calyx usually large, striate; calyx infundibular, the 2 upper lobes subconnate only at base; petals large, the standard the largest, suborbicular, not appendaged, the wings adherent to keel, the keel petals shorter than wings; stamens with the vexillary filament free or subconnate with the others, the anthers uniform or alternately dorsifixed and subbasifixed; ovary stipitate, linear, compressed, the ovules 2–many, the style elongated, incurved, bearded distally on vexillary side, the stigma terminal; fruits linear-oblong, compressed, beaked, sometimes longitudinally ribbed, dehiscent, the seeds ellipsoid or subglobose, compressed, the hilum small.

LECTOTYPE SPECIES: *Clitoria ternatea* L. (vide Britton & Brown, Ill. Fl. N. U. S. ed. 2: 2: 416. 1913), one of Linnaeus's four original species.

DISTRIBUTION: Pantropical and subtropical but mostly American, with 30–70 species. One introduced species has become naturalized in Fiji.

1. *Clitoria ternatea* L. Sp. Pl. 753. 1753; Seem. Fl. Vit. 74. 1865; Gibbs in J. Linn. Soc. Bot. 39: 144. 1909; Greenwood in Proc. Linn. Soc. 154: 96. 1943; Yuncker in Bishop Mus. Bull. 178: 63. 1943, in op. cit. 220: 145. 1959; J. W. Parham, Pl. Fiji Isl. 72. 1964, ed. 2. 110. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 147. 1970; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 515. fig. 75. 1971, Man. New Guinea Leg. 502. fig. 123. 1979.

A perennial climbing or sprawling herb, cultivated and also naturalized along roadsides and in villages, clearings, and canefields, at elevations up to about 300 m. The slender stems may be 3 m. long, and the rootstock is woody. The leaflets are 5 or 7 (rarely 9), the blades oblong to elliptic, 2.5–7 × 1.5–4 cm., appressed-pilose but subglabrate on both sides. The flowers are solitary or paired in leaf axils; the calyx is about 2 cm. long, with conspicuous basal bracteoles and lobes; and the standard is blue to violet, with a pale yellow or white proximal blotch, up to 5 × 4 cm., and finely puberulent dorsally. The linear-oblong fruits are thick-margined and slightly broadened distally, up to 12 × 1 cm., appressed-pilose but subglabrate, with 6–10 seeds, these pale or dark brown with darker mottling, up to 8 × 4 × 2.5 mm. Flowers and fruits occur throughout the year.

LECTOTYPIFICATION: Of the several references given by Linnaeus, the logical choice is represented by *Hermann* (3: 13, 20; 4: 49) (BM LECTOSYNTYPES), from Ceylon (Verdcourt, 1971, cited above).

DISTRIBUTION: Although the original distribution of this now pantropical species is not certain, it was probably indigenous in tropical America. More than 20 Fijian collections are at hand.

LOCAL NAMES AND USE: The *butterfly pea* has been recorded in Fiji as *latoela* (Yasawas) and *nawa* (Tuvutha). It was introduced as an ornamental before 1860, when

Seemann noted it but did not collect a voucher, and is often grown as a trellis plant. The species has become so thoroughly naturalized that it is sometimes considered indigenous.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Along Wailevu Creek, *St. John 18082*. VITI LEVU: MBA: Lautoka, *Greenwood 145*; Nandi, *DA 9691*; Rarawai, near Mba, *Greenwood 145B*. NANDRONGA & NAVOSA: Agricultural Station, Nathotholevu, near Singatoka, *DA 12317*. SERUA: Ngaloa, *DA 5758*. RA: Thamboni, *DA 11471*. NAITASIRI: Cocoa Station, Nanduruloulou, *DA 12149*. REWA: Suva: *Meebold 16504*. KORO: Eastern slope of main ridge, *Smith 1028*. NGAU: Sawaieke, *Smith 7894*. VANUA LEVU: MATHUATA: Lambasa, *Greenwood 145A*. VANUA MBALAVU: Sawana, *DA 13260*. TUVUTHA: *Bryan 546*.

40. *PSOPHOCARPUS* DC. Prodr. 2: 403. 1825; Hutchinson, Gen. Fl. Pl. 1: 442, as *Psophocarpus* Necker. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 602. 1971; Verdcourt & Halliday in Kew Bull. 33: 191. 1978; Verdcourt, Man. New Guinea Leg. 530. 1979. Nom. cons.

Herbs or shrubs, usually climbing or prostrate, the stipules prolonged below point of insertion; leaves pinnately trifoliolate (as in our species) or unifoliolate, stipellate; inflorescences axillary, pseudoracemose or with fasciculate or solitary flowers, the rachis nodose, the bracts small, caducous, the bracteoles larger, membranous; calyx 5-lobed, the 2 upper lobes forming an entire or bifid lip; petals predominantly blue or purplish, the standard suborbicular, basally auriculate, glabrous, the wings oblique, obovate, the keel petals sharply incurved distally; stamens 10, the vexillary filament free or somewhat connate to tube of the others in middle, the anthers dorsifixed (5) and basifixed (5) alternating; ovary short-stipitate, winged, the ovules few-many, the style thickened above ovary, bent, flattened toward apex, glabrous but longitudinally bearded (as in our species) or with a ring of hairs below stigma, the stigma terminal or internal, penicillate; fruits oblong, distinctly 4-winged along angles, somewhat septate between seeds, dehiscent, the seeds ovoid to ellipsoid, an aril present or absent.

TYPE SPECIES: *Psophocarpus tetragonolobus* (L.) DC. (*Dolichos tetragonolobus* L.).

DISTRIBUTION: Paleotropical and possibly indigenous only in Africa and Madagascar, with nine species, one of them of doubtful geographic origin and perhaps Asian. One or two species have been widely cultivated.

USEFUL TREATMENT OF GENUS: VERDCOURT, B., & P. HALLIDAY. A revision of *Psophocarpus* (Leguminosae-Papilionoideae-Phaseoleae). Kew Bull. 33: 191-227. 1978.

1. *Psophocarpus tetragonolobus* (L.) DC. Prodr. 2: 403. 1825; Merr. Interpret. Rumph. Herb. Amb. 286. 1917; J. W. Parham, Pl. Fiji Isl. 76. 1964, ed. 2. 116. 1972; Purseglove, Trop. Crops, Dicot. 315. fig. 49. 1968; Smartt, Trop. Pulses, 74. fig. 2.14. 1976; Verdcourt & Halliday in Kew Bull. 33: 196. fig. 3. 1978; Verdcourt, Man. New Guinea Leg. 533. fig. 130. 1979.

Dolichos tetragonolobus L. Syst. Nat. ed. 10. 1162. 1759.

A climbing annual or perennial herb, occasionally cultivated near sea level, the glabrous stems attaining a length of 4 m. The leaflet blades are deltoid-ovate and acute, up to 15 × 12 cm. The pedunculate inflorescences are 2-10-flowered, the calyx is green to reddish purple, and the petals are mauve, often tinged with yellow, red, or white, the standard being 2.5-4 cm. long. The linear-oblong fruits, usually about 10-30 × 3 cm., are green and sometimes red-spotted, with serrated wings as much as 1 cm. broad. The seeds are 5-20, to 1 cm. in length, and yellowish to brown or mottled. Our only available collection was fruiting in July.

TYPIFICATION: The whole basis of *Dolichos tetragonolobus* is *Lobus quadrangularis* Rumph. Herb. Amb. 5: 374. t. 133. 1747, based on material cultivated in Amboina.

DISTRIBUTION: No wild specimens of *Psophocarpus tetragonolobus* have ever been found, and there is disagreement as to its place of origin, some authors believing its home to have been in Madagascar or Mauritius, where *P. scandens* (Endl.) Verdcourt, conceivably its wild ancestor, is not uncommon. Verdcourt and Halliday (1978, cited above) suggest that *P. tetragonolobus* may be an improved race of a native Asian species. It is now widely cultivated in tropical and subtropical areas.

LOCAL NAMES AND USES: The most frequently used names, *winged bean* and *Goa bean*, are noted in Fiji. The plant has a high protein content and most parts of it are edible, including the young shoots, leaves, young fruits, seeds, and the tuberous root. It is also useful as a cover crop and fodder plant. In spite of its notably high nutritive value, *Psophocarpus tetragonolobus* seems to have been a comparatively recent introduction into Fiji, where it is not common in cultivation. Most often only the young pods are cooked and eaten in the manner of string beans.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Cocoa Station, Nanduruloulou, DA 12177.

41. **LABLAB** Adanson, *Fam. Pl.* 2: 325. 1763; Hutchinson, *Gen. Fl. Pl.* 1: 440. 1964; Verdcourt in *Fl. Trop. E. Afr. Leg. Papil.* 696. 1971; Maréchal in *Boissiera* 28: 244. 1978; Verdcourt, *Man. New Guinea Leg.* 535. 1979.

Suberect or climbing herb, without uncinat hairs, the stipules usually reflexed and persistent, not produced below point of insertion; leaves pinnately trifoliolate, the stipels lanceolate; inflorescences axillary, pseudoracemose, long-pedunculate, the flowers in clusters of 2-4 at nodes along rachis, the bracts and bracteoles caducous, the pedicel about equal to calyx in length; calyx campanulate, bilabiate, the 2 upper lobes joined into an entire or emarginate lip, the lower lip 3-lobed; petals small, the standard orbicular, reflexed, auriculate at base, with 2 carnosae, parallel callosities, the wings longer than keel, the keel petals incurved at a right angle, obtuse, with a small, convex pocket at base; stamens 10, the filaments of 9 connate into a sheath, the vexillary filament free or loosely joined to sheath, the anthers uniform; ovary with several ovules, the style incrassated, lacking a tenuous basal portion, longitudinally flattened, incurved at a right angle, short-barbate distally adaxially, the stigma terminal, glabrous; fruits obliquely oblong-falcate, laterally compressed, with salient margins, tipped by the persistent style, with spongy septa, the seeds ovoid, slightly compressed, the hilum linear, with a whitish rim-aril.

TYPE SPECIES: *Lablab purpureus* (L.) Sweet (*Dolichos purpureus* L.). For a long period this same species (as *Dolichos lablab* L.) had been considered the lectotype species of *Dolichos*, but after many discussions it was agreed to accept *Dolichos trilobus* L. to lectotypify that genus. Since the genus that includes *D. lablab* is now considered monotypic, a great number of new combinations would have been required without the present conservation of *Dolichos* in the sense of *D. trilobus*. The complex situation is summarized in *Taxon* 21: 533. 1972. The genus *Dolichos* in its presently accepted sense does not occur in Fiji.

DISTRIBUTION: Paleotropical and monotypic, now widely cultivated and often naturalized in tropical areas.

1. **Lablab purpureus** (L.) Sweet, *Hort. Brit.* 481. 1827; Verdcourt in *Kew Bull.* 24: 410. 1970, in *Fl. Trop. E. Afr. Leg. Papil.* 696. *fig. 104* (subsp. *uncinatus*, *bengalensis*). 1971; Maréchal in *Boissiera* 28: 244. 1978; Verdcourt, *Man. New Guinea Leg.* 537. *fig. 131* (subsp. *purpureus*). 1979.

Dolichos lablab L. *Sp. Pl.* 725. 1753; Drake, *Ill. Fl. Ins. Mar. Pac.* 155. 1890; Greenwood in *Proc. Linn. Soc.* 154: 96. 1943; Yuncker in *Bishop Mus. Bull.* 178: 66. 1943, in *op. cit.* 220: 150. 1959; J. W. Parham, *Pl. Fiji Isl.* 74. 1964, ed. 2. 112. 1972; Sykes in *New Zealand Dept. Sci. Indust. Res. Bull.* 200: 154. 1970.

Dolichos purpureus L. Sp. Pl. ed. 2. 1021. 1763.

Lablab niger Medik. in Vorles. Churpfalz. Phys.-Oecon. Ges. 2: 354. 1787; Purselove, Trop. Crops, Dicot. 273. fig. 42. 1968; Smartt, Trop. Pulses, 61. fig. 2.8, 2.18 (16). 1976.

Lablab vulgaris Savi in Nuovo Giorn. Lett. III. 8: 116. fig. 8, a-c. 1824; A. Gray, Bot. U. S. Expl. Exped. 1: 453. 1854; Seem. in Bonplandia 9: 255. 1861, Viti, 435. 1862, Fl. Vit. 62. 1865; Guillaumin in J. Arnold Arb. 12: 246. 1931.

Lablab vulgaris var. *albiflorus* DC. Prodr. 2: 401. 1825; Seem. Fl. Vit. 62. 1865.

As seen in Fiji, *Lablab purpureus* is a perennial scrambling vine, cultivated and naturalized but sometimes appearing to be indigenous, often found in beach thickets but sometimes in open places or waste places up to about 450 m. Although the cultivated plant is typically flushed with purple in all its parts, this is not always obvious in naturalized individuals. The leaflet blades are deltoid-ovate, up to about 15 × 14 cm., and acute to acuminate. The inflorescences are often up to 50 cm. long; the standard, up to 1.5 cm. in diameter, and other petals vary from purple to mauve or white (in most Pacific archipelagoes the petal color is noted as white). Fruits (in subsp. *purpureus*) are as large as 10 × 4 cm., with seeds white to red or black and usually not larger than 15 × 9 × 5 mm. Our material is too sparsely dated to suggest seasonality.

TYPEFICATION AND NOMENCLATURE: The type of *Dolichos lablab* is *Phaseolus niger lablab* of Alpini, from Egypt (1592); *Lablab niger* and *L. vulgaris* were new names for *Dolichos lablab*. No type for *Dolichos purpureus* seems to be present in the Linnaean Herbarium. *Lablab vulgaris* var. *albiflorus* was based by de Candolle on *Dolichos bengalensis* Jacq. Hort. Bot. Vindob. 2: 57. 1772. Of the several earlier references cited by Linnaeus under *Dolichos lablab*, Verdcourt (1971, cited above) indicated the type (lectotype) as Alpini's name. As the epithet cannot be used in the genus *Lablab*, the oldest available epithet is provided by *Dolichos purpureus*, the type of which has not been found.

DISTRIBUTION: Paletropical. Although the most frequently cultivated subspecies (subsp. *purpureus*), the form of the species known from Pacific islands, presumably originated in Asia, related wild subspecies are indigenous in Africa as well as in Asia. There are many varieties or cultivars of subsp. *purpureus*, some of which (as in Fiji) are so thoroughly naturalized as to appear indigenous. The species was probably an aboriginal introduction into many Pacific archipelagoes; it was present in Tahiti at the time of Cook's visits, and it has well-known Fijian names, although in 1860 Fijians seemed unaware that the seeds were edible (Seemann, 1865).

LOCAL NAMES AND USES: Fijian names for the *hyacinth bean* are *ndralawa*, *natomba*, and *tomba*; elsewhere the species is known as *bonavist(e) bean*, *lablab bean*, *Egyptian kidney bean*, and *dolichos*. The species has doubtless been introduced in recent times as a cover crop, for pasture improvement, and for fodder, as it has a high protein content. The leaves, young pods, and seeds are edible. If originally an aboriginal introduction it may have been considered an emergency food plant and subsequently neglected.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mountains inland from Lautoka, *Greenwood 368*. TAILEVU: Mburetu, *DA 87*. REWA: Suva, near wharf, *DA 14534*. OVALAU: *Milne 235*. TAVEUNI: Somosomo, *Seemann 118*. MATUKU: *Bryan 236*. KAMBARA: *Tothill 123*. FIJI without further locality, *U. S. Expl. Exped., DA 11836*.

42. **MACROTYLOMA** Verdcourt in Kew Bull. 24: 322, 400. 1970, in Fl. Trop. E. Afr. Leg. Pabil. 581. 1971, Man. New Guinea Leg. 529. 1979. Nom. cons.

Dolichos a. *Macrotyloma* Wight & Arn. Prodr. Fl. Ind. Orient. 248. 1834.

Dolichos subgen. *Macrotyloma* Baker in Hook. f. Fl. Brit. Ind. 2: 210. 1876.

Kerstingiella Harms in Ber. Deutsch. Bot. Ges. 26a: 230. 1908. Nom. rejic.

Annual or perennial herbs, climbing or trailing or sometimes erect, the rootstock sometimes ligneous, the stipules not produced below point of insertion; leaves pinnately trifoliolate (as in our species) or less often unifoliolate, stipellate; inflorescences axillary or racemiform at stem apices, fasciculate; calyx with the 2 upper lobes joined to form an entire or bifid lip; petals comparatively small, the standard elliptic to suborbicular, usually auriculate, with 2 linear, lamelliform appendages on inner surface, the wings narrow, the keel petals not twisted; stamens 10, the filaments of 9 connate into a sheath, the vexillary filament free, the anthers uniform; ovary with 3-13 ovules, the style subfiliform, glabrous or short-pilose but not barbate, the stigma terminal, subcapitate, usually surrounded by a ring of hairs; fruits straight or curved, compressed, not septate, dehiscent, the valves often twisting, the seeds compressed, the hilum short, the rim-aril inconspicuous or none.

LECTOTYPE SPECIES: *Macrotyloma uniflorum* (Lam.) Verdcourt (*Dolichos uniflorus* Lam.).

DISTRIBUTION: Africa and Asia, with about 24 species, some of which are now widely cultivated and sometimes naturalized. Two species have been cultivated in Fiji for potential pasture improvement, but their establishment is not yet recorded.

KEY TO SPECIES

Lower and lateral calyx lobes deltoid-lanceolate, 3-8 mm. long, abruptly attenuate into a long, filiform apex 2-several times longer than the expanded basal portion of the lobe; standard obovate-oblong, up to 12 × 7 mm.; fruits 3-5.5 cm. long and (in var. *uniflorum*) 6-8 mm. broad; stems with spreading indument.

1. *M. uniflorum*

Lower and lateral calyx lobes acuminate but not filiform, the acumen no more than 1.5 times as long as the expanded basal portion of the lobe; standard (in var. *glabrum*) up to 15 × 9 mm.; fruits 3-8 cm. long and 6-8 mm. broad; stems with appressed indument (in var. *glabrum*). 2. *M. axillare*

1. ***Macrotyloma uniflorum*** (Lam.) Verdcourt in Kew Bull. 24: 322, 401, pl. 8 (13). 1970, in Fl. Trop. E. Afr. Leg. Papil. 583. 1971.

Dolichos uniflorus Lam. Encycl. Méth. Bot. 2: 299. 1786; Pursglove, Trop. Crops, Dicot. 263. 1968; Smartt, Trop. Pulses, 58, fig. 2.18 (15). 1976.

Dolichos biflorus sensu J. W. Parham, Pl. Fiji Isl. ed. 2. 112. 1972, et auth. mult.; non L.

A suberect or twining herb, perennial or (in cultivation) annual, up to 50 cm. high, sparingly cultivated near sea level. The stems are slender, with soft, spreading, pale hairs. The elliptic to ovate leaflet blades, usually not more than 5 cm. long at maturity, are soft-white-pilose on both surfaces when young. The inflorescences are usually 2- or 3-flowered, with calyx lobes longer than the tube; the petals are cream-colored to pale or greenish yellow, the standard being obovate-oblong, up to 12 × 7 mm., and inconspicuously purple-blotched within. The fruits are pilose with pale, spreading hairs and at length glabrate, usually with 5-7 seeds up to 6 × 4 × 2 mm. and pale to dark red-brown or black or mottled. The single available collection bore flowers and fruits in May.

TYPIFICATION: The species is based on a plant grown in the Jardin du Roi, Paris, from seeds obtained in India by Sonnerat (P-LA HOLOTYPE).

DISTRIBUTION: India to South Africa. Of the several varieties accepted by Verdcourt (1970, 1971), our material represents var. *uniflorum*, indigenous in India but cultivated elsewhere in tropical areas. It was introduced into Fiji in 1964 for trial and is perhaps still limited to introduction gardens.

LOCAL NAMES AND USES: The *horse gram* was recorded by Parham (1972, cited above) as *kulthi*, a non-Fijian name that I am unable to trace. In India the seeds are used in various ways, being edible after cooking, and the entire plant is used as fodder. Elsewhere it is cultivated as a cover crop or a green manure.

AVAILABLE COLLECTION: VITI LEVU: MBA: Mba closed area, in trial plots, *DA 14353*. This plant was grown from *FDA* introduction no. 15999, from seeds collected in Queensland by W. F. Wildin and received in Fiji on Nov. 28, 1964 (cf. Dept. Agr. Fiji Pl. Introduction List no. 12. 1965). Three introductions were made at the same time (as *Dolichos biflorus*).

2. **Macrotyloma axillare** (E. Meyer) Verdcourt in Kew Bull. 24: 402. *pl. 4 (14)*. 1970, in Fl. Trop. E. Afr. Leg. Papil. 586. 1971, Man. New Guinea Leg. 530. *fig. 129*. 1979.

Dolichos axillaris E. Meyer, Comm. Pl. Afr. Austr. 1: 144. 1838.

The variety introduced into Fiji is presumably var. *glabrum* (E. Meyer) Verdcourt (1970, 1971, 1979, cited above), the variety with comparatively small flowers and sparse, rather dense, appressed hairs, which has been used as a pasture legume in tropical and subtropical parts of Australia.

TIPIFICATION (of var. *glabrum*): The basionym is *Dolichos axillaris* var. *glaber* E. Meyer (1838, loc. cit.), typified by *Drège* (K ISOTYPE), from Natal, South Africa.

DISTRIBUTION (of var. *glabrum*): Tropical Africa, Madagascar, Mauritius, and Ceylon, cultivated elsewhere. No Fijian herbarium voucher is available, but this taxon (as *Dolichos axillaris*) was introduced into Fiji by W. F. Wildin (*FDA 16000-16004*) at the same time as *Macrotyloma uniflorum*. It probably persists in one or more introduction gardens and may be anticipated in use for pasture improvement.

43. VIGNA Savi in Nuovo Giorn. Lett. III. 8: 113. 1824; Seem. Fl. Vit. 62. 1865; Hutchinson, Gen. Fl. Pl. 1: 438. 1964; Verdcourt in Kew Bull. 24: 526. 1970, in Fl. Trop. E. Afr. Leg. Papil. 617. 1971; Maréchal in Boissiera 28: 1978; Verdcourt, Man. New Guinea Leg. 515. 1979. Nom. cons.

Voandzeia Thou. Gen. Nova Madagasc. 23. 1806. Nom. rejic.

Climbing or prostrate herbs or shrubs, rarely short and erect, lacking uncinata hairs, the rootstocks usually ligneous or tuberous, the stipules produced below point of insertion or not; leaves pinnately trifoliolate (as in our species) or rarely subdigitately trifoliolate or unifoliolate, the stipules more or less persistent; inflorescences axillary or terminal, pseudoracemose (or densely subumbellate or fasciculate), the rachis contracted, the flowers often in nodose fascicles, never more than 2 per node, the bracts and bracteoles small, caducous, the pedicels thick, shorter than or about as long as calyx; calyx bilabiate, the 2 upper lobes completely or partly united, the lower lip 3-lobed (middle lobe usually the longest); petals yellow or purplish, the standard orbicular, with inflexed auricles and usually with 1-4 appendages, the wings slightly shorter than standard, the keel petals about as long as wings or longer, obtuse or beaked, sometimes incurved through up to 360° (in our species spirally incurved for 2-3 turns only in *V. adenantha*), sometimes twisted and with a conical pocket on left-hand petal; stamens 10, alternately slightly longer and shorter, the filaments of 9 connate into a sheath, the vexillary filament free, the anthers uniform; ovary sessile, the ovules 3-many, the style with the tenuous lower part filiform to flattened or rarely obsolete, the upper part thickened, straight or curved, bearded lengthwise proximally within, sometimes produced beyond stigma into a beak, the stigma oblique or introrsely lateral, rarely subterminal; fruits linear to oblong-linear, subterete or flattened, straight or somewhat incurved, dehiscent, not septate, the style caducous, the seeds reniform or quadrate, the hilum short to elongate, the rim-aril well developed to obsolete.

TYPE SPECIES: *Vigna luteola* (Jacq.) Benth. (*Dolichos luteolus* Jacq., the only species mentioned by name in the original protologue of the genus).

DISTRIBUTION: Pantropical, with about 150 species. Eight species are here recorded from Fiji, three of them indigenous (one being a common component of beach

vegetation) and the others introduced and sometimes naturalized. The genus includes many species of agricultural importance.

USEFUL TREATMENT OF GENUS: MARÉCHAL, R., J. M. MASCHERPA, & F. STAINIER. Etude taxonomique d'un groupe complexe d'espèces des genres *Phaseolus* et *Vigna* (Papilionaceae) sur la base de données morphologiques et polliniques, traitées par l'analyse informatique. *Boissiera* 28: 1-273. 1978. (This important contribution summarizes current concepts in the genus *Vigna* and its close relatives. The chapter "Proposition de classification," pp. 133-252, is by Maréchal alone and in the present treatment is so cited.)

Specialists in the subtribe *Phaseolinae* have found it difficult to propose sound distinctions among the genera *Phaseolus*, *Vigna*, and their close relatives, the problem being informatively discussed by Verdcourt (in *Kew Bull.* 24: 507-525. 1970) and Maréchal, Mascherpa, and Stainier (1978, cited above). In the following key to species occurring in Fiji, the subgenera and sections utilized by Maréchal (1978) are parenthetically indicated, although the key statements, of course, do not provide full criteria for those infrageneric taxa.

KEY TO SPECIES

- Stipules distinctly peltate or at least well produced both above and below point of attachment, 8-25 mm. long; keel truncate, obtuse, or beaked, the beak sometimes incurved but through no more than 360° or 1 complete turn.
- Keel bearing a prominent, hornlike pocket on one side; petals yellow, sometimes tinged with pink or purple; style with the thickened part very strongly curved, prominently and strongly beaked beyond the stigma (subgen. *Ceratotropis*).
- Leaflet blades 5-8 cm. long, deeply divided into 3-5 narrow lobes; fruits up to 5 cm. long and 5 mm. broad, with short, stiff hairs; seeds 4-9; cultivated only. 1. *V. aconitifolia*
- Leaflet blades entire or with 2 or 3 very shallow, broad lobes; fruits 4-16 cm. long and 3-6 mm. broad; seeds 6-15.
- Fruits glabrous at maturity, 8-16 cm. long, 3-5 mm. broad; seeds comparatively large, 4-9 × 3.5-5 mm., predominantly castaneous to blackish-speckled, the rim-aril distinctly raised; stems with short, white hairs; leaflet blades ovate, up to 15 × 8 cm.; inflorescences densely conical, usually 5-20-flowered, long-pedunculate; cultivated and sparingly naturalized. 2. *V. umbellata*
- Fruits bristly-pilose or scabridulous, usually 4-10 cm. long and 4-6 mm. broad; seeds up to 5 × 4 mm.; stems with conspicuous, yellow to brown or ferruginous hairs; leaflet blades elliptic to ovate, oblong, or lanceolate, up to 16 × 12 cm.; inflorescences not densely conical.
- Erect annual herbs, cultivated or infrequently naturalized; fruits with long or short, bristly hairs, suberect or horizontal; stem and peduncle indument composed of spreading hairs.
- Stems and fruits densely covered with long hairs, the fruits suberect, copiously pilose with pale to ferruginous hairs 3-4 mm. long; seeds 6-10, black to dull olive-green, with a distinctly raised rim-aril around hilum; stipules ovate to lanceolate, up to 15 × 4 mm.; inflorescences usually 5- or 6-flowered; petals uniformly bright yellow. 3. *V. mungo*
- Stems and fruits less densely pilose, or hairs shorter, the fruits horizontal, with dark brown, short, spreading hairs; seeds 10-15, greenish to brown or blackish, the rim-aril not raised; stipules peltate, ovate, up to 18 × 10 mm.; inflorescences 4-25-flowered; petals pale yellow, often pink- to purple-tinged. 4. *V. radiata*
- Twining or climbing perennial, indigenous; fruits reflexed to pendulous, pale-strigillose, becoming scabridulous; stem and peduncle indument composed of strongly reflexed, fulvous hairs (1-) 1.5-3 mm. long; stipules oblong-lanceolate, up to 12 × 4 mm.; inflorescences with peduncles 8-30 cm. long and rachises 3-5 cm. long, few-flowered; petals uniformly bright yellow. 5. *V. reflexo-pilosa*
- Keel without pockets; petals white or greenish, tinged with yellow, blue, or purple; style with the thickened part slightly curved and with a short, upturned beak beyond the stigma; fruits in our subspecies very variable, 7.5-100 cm. long, 3-11 mm. broad, glabrous; leaflet blades usually 6-16 × 4-11 cm., entire or sometimes inconspicuously lobed; cultivated only (subgen. *Vigna*, sect. *Catiang*). 6. *V. unguiculata*
- Stipules ovate or oblong-ovate, conspicuously or obviously nerved, 2-5 mm. long, not obviously produced below point of attachment; indigenous species.
- Keel not much longer than other petals, incurved for about half a complete turn or less; petals yellow, the standard usually 12-14 mm. in diameter; fruits linear-oblong, usually 4-8 cm. × 5-7 mm.; stipules 2-3 mm. long, inconspicuously bilobed at base, caducous; leaflet blades rhomboid-elliptic to obovate, rounded to emarginate at apex; abundant along beaches, usually not found much above sea level (subgen. *Vigna*, sect. *Vigna*). 7. *V. marina*

Keel elongated, about 5 cm. long, the apex beaked and spirally incurved for 2-3 complete turns; petals whitish to pale pink or purplish blue, the standard 15-25 mm. in diameter; fruits broadly linear, usually 8-14 cm. \times 7-14 mm.; stipules 3-5 mm. long, truncate at base, subsistent; leaflet blades ovate to rhomboid, obtuse to acute and mucronulate at apex; species of dry areas and open grassland, occurring near sea level and also inland along streams (subgen. *Sigmoidotropis*, sect. *Leptospron*).
8. *V. adenantha*

1. **Vigna aconitifolia** (Jacq.) Maréchal in Bull. Jard. Bot. Nat. Belge 39: 160. (June) 1969; Verdcourt in Kew Bull. 23: 464. (Nov.) 1969, in op. cit. 24: 557. 1970; Maréchal in Boissiera 28: 213. 1978.

Phaseolus aconitifolius Jacq. Obs. Bot. 3: 2. t. 52. 1768; J. W. Parham, Pl. Fiji Isl. 75. 1964, ed. 2. 115. 1972; Pursglove, Trop. Crops, Dicot. 286. 1968; Smartt, Trop. Pulses, 65. 1976.

A slender, trailing, freely branching, annual herb to 30 cm. high, found only in cultivation near sea level. The peltate stipules are about 12 mm. long, with lanceolate lobes, and the leaflet blades are 5-8 cm. long, deeply 3-5-divided into lobes. The axillary inflorescences have peduncles 5-10 cm. long and the rachis short, with 2-5 flowers with yellow petals. The small fruits are subcylindric, up to 5 cm. long and 5 mm. broad, brown, and with short, stiff hairs; the 4-9 seeds are rectangular, about 5 mm. long, yellow to brown or black-mottled, with the hilum linear and white.

TYPIFICATION: Jacquin cited Petiver, "hort. sicc. ined.," the holotype perhaps being at BM.

DISTRIBUTION: Indigenous in southeastern Asia (Pakistan, India, Burma), early spread to other parts of the Old World and to the New World early in the twentieth century. It is probably a fairly recent introduction into Fiji, having first been noted in cultivation about 1942.

LOCAL NAMES AND USES: Names used in Fiji are *moth* (Hindi) and *moth bean*; elsewhere the species is sometimes known as *mat*. The green pods are edible as a vegetable, and the ripe seeds are also edible when cooked. The plant is sometimes grown for fodder and as a green manure.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Nakandi, DA 2616. TAILEVU: Kandavulevu road, near Naila, DA 5641.

2. **Vigna umbellata** (Thunb.) Ohwi & Ohashi in J. Jap. Bot. 44: 31. 1969; Verdcourt in Kew Bull. 24: 560. 1970; Maréchal in Boissiera 28: 214. 1978; Verdcourt, Man. New Guinea Leg. 525. 1979.

Dolichos umbellatus Thunb. in Trans. Linn. Soc. 2: 339. 1794.

Phaseolus calcaratus Roxb. Fl. Ind. ed. 2. 3: 289. 1832; Greenwood in Proc. Linn. Soc. 154: 96. 1943; J. W. Parham, Pl. Fiji Isl. 75. 1964, ed. 2. 115. 1972; Pursglove, Trop. Crops, Dicot. 294. 1968; Smartt, Trop. Pulses, 68. fig. 2.18 (7). 1976.

A climbing or suberect annual herb, cultivated and also sparingly naturalized near sea level, the stems 1.5-3 m. long or tall and with short, white hairs. The stipules are ovate-lanceolate, striate, about 1 cm. long and 2-3 mm. broad. The usually ovate leaflet blades are 5-15 \times 3-8 cm., entire or faintly 3-lobed, acute at apex, and usually pilose. The long-pedunculate inflorescences have a short rachis bearing 5-20 flowers in a dense cone, and the bracteoles are linear, longer than the calyx. The petals are yellow, 12-20 mm. long, the keel with a long pocket. The fruits are 8-16 cm. long and 3-5 mm. broad, glabrous at maturity, and with 8-15 brown to yellow or blackish-speckled seeds up to 9 \times 5 mm., the rim-aril being white and distinctly raised.

TYPIFICATION AND NOMENCLATURE: *Dolichos umbellatus* is typified by no. 16789 preserved at UPS (Verdcourt, 1970). Roxburgh mentions that *Phaseolus calcaratus* was grown at the Calcutta Botanic Garden from seed sent by Benjamin Heyne from a cultivated plant in Mysore. Specialists now agree on this synonymy.

DISTRIBUTION: From the Himalayas and central China into Malesia, now culti-

vated elsewhere in the Old World tropics. It was introduced into Fiji in 1920 (Greenwood, 1943, cited above). Of the two varieties recognized by Maréchal (1978), the commonly cultivated plant represents var. *umbellata*.

LOCAL NAME AND USES: The well-known name *rice bean* is utilized in Fiji. The boiled seeds are often eaten with or as a substitute for rice; the young foliage and fruits may be cooked and eaten as a vegetable, and the plant is also sometimes used for fodder and as a green manure.

AVAILABLE COLLECTION: VITI LEVU: MBA: Lautoka, W. L. Parham (?) 799 (April 8, 1929) (κ).

3. *Vigna mungo* (L.) Hepper in Kew Bull. **11**: 128. 1956; Verdcourt in op. cit. **24**: 558. 1970; Maréchal in Boissiera **28**: 209. 1978; Verdcourt, Man. New Guinea Leg. 521. 1979.

Phaseolus mungo L. Mant. Pl. 101. 1767; J. W. Parham, Pl. Fiji Isl. 76. 1964, ed. 2. 116. 1972; Pursleglove, Trop. Crops, Dicot. 301. fig. 46. 1968; Smartt, Trop. Pulses, 68. fig. 2.11. 1976.

Phaseolus aureus sensu Greenwood in Proc. Linn. Soc. **154**: 96. 1943; non Roxb.

An erect or suberect, branched, annual herb to 80 cm. high, cultivated near sea level and occasionally naturalized along roadsides, in waste places, and on cultivated land. The stems have copious yellow or ferruginous hairs, and the stipules are ovate to lanceolate, up to 15 × 4 mm. The leaflet blades are elliptic to ovate, sometimes oblong-lanceolate, usually 5–16 × 3–12 cm., entire or inconspicuously lobed, acute, and bristly-pilose on both surfaces or becoming glabrate. The inflorescences are composed of about 5 or 6 flowers on a short rachis at the end of a peduncle 4–10 cm. long. The petals are uniformly bright yellow, 10–16 mm. long. The fruits are suberect, compressed-cylindric, usually 4–7 cm. long and 5–6 mm. broad, copiously pilose with pale to ferruginous hairs 3–4 mm. long, and with 6–10 seeds, these black or dull olive-green, oblong, up to 5 × 4 mm., and with the rim-aril raised.

TYPIFICATION: Linnaeus's only original reference was to "Pluk. alm. 290," presumably Plukenet's *Almagestum Botanicum*, t. 290. 1694.

DISTRIBUTION: A plant of ancient cultivation in India and not known in a wild state, but perhaps ultimately derived from *Vigna radiata* var. *sublobata* (Roxb.) Verdcourt, the wild form of *mungo*. A degree of confusion between the *black gram* (*V. mungo*) and the *green gram* (*V. radiata*) has been pointed out by Verdcourt (in Fl. Trop. E. Afr. Leg. Papil. 621, 656. 1971), but the crops are totally different. The *black gram* was probably introduced into Fiji in the early 1900's.

LOCAL NAMES AND USES: The commonly used names *black gram*, *urd* (Hindi), and *woolly pyrol* are noted in Fiji. The young pods are used as a vegetable, the ripe seeds are boiled and eaten. The species is also often used as a cover crop or a green manure. Many cultivars have been developed in India.

AVAILABLE COLLECTIONS: VITILEVU: RA: Penang, Greenwood 510A. NAITASIRI: Principal Agricultural Station, Koronivia, DA 7003. VANUA LEVU: MATHUATA: Lambasa, Greenwood 510.

4. *Vigna radiata* (L.) Wilczek in Fl. Congo Belge **6**: 386. 1954; Verdcourt in Kew Bull. **24**: 558. 1970, in Fl. Trop. E. Afr. Leg. Papil. 655. 1971; Maréchal in Boissiera **28**: 209. 1978; Verdcourt, Man. New Guinea Leg. 523. 1979.

Phaseolus radiatus L. Sp. Pl. 725. 1753.

Phaseolus aureus Roxb. Fl. Ind. ed. 2. 3: 297. 1832; J. W. Parham, Pl. Fiji Isl. 75. 1964, ed. 2. 115. 1972; Pursleglove, Trop. Crops, Dicot. 290. fig. 44. 1968; Smartt, Trop. Pulses, 66. fig. 2.10, 2.18 (11). 1976.

An erect (in cultivated variants) or twining annual herb, occasionally cultivated near sea level. The stems have long, spreading, yellow to brown, bristly hairs, and the stipules are peltate, ovate, and up to 18 × 10 mm. The leaflet blades are very similar to those of *Vigna mungo*, but the inflorescences may have more numerous (4–25) flowers;

the petals are pale yellow, with the keel (and other) petals pink- to purple-tinged. The fruits are horizontal, linear-cylindric, 4-10 cm. long and 4-6 mm. broad, with a dark brown, short, spreading, bristly indument; the 10-15 seeds are greenish to brown or blackish, oblong-cylindric to subglobose, up to $4.2 \times 3.2 \times 2.8$ mm., and with the rim-aril not developed.

TYPIFICATION AND NOMENCLATURE: Of Linnaeus's several original references, Verdcourt (1971, cited above) has indicated as **LECTOTYPE** *Phaseolus zeylanicus siliquis* . . . of Dillenius, Hort. Eltham. 315. t. 235, fig. 304. 1732, from Ceylon. The synonym *Phaseolus aureus* is in the same place typified by Roxburgh drawing 1604 (κ **HOLOTYPE**), based on a plant from Bengal, India.

DISTRIBUTION: *Vigna radiata* var. *radiata* is considered the Indian cultivated crop of ancient origin derived from var. *sublobata* (Roxb.) Verdcourt (*Phaseolus sublobata* Roxb. Fl. Ind. ed. 2. 3:288. 1832, based on Roxburgh drawing 1158 (κ **LECTOTYPE**), cf. Verdcourt, 1971). Variety *radiata* is now grown in tropical and subtropical areas throughout the world. Probably it was introduced into Fiji during the present century.

LOCAL NAMES AND USES: Names applied to this taxon in Fiji, as elsewhere, are *green gram*, *golden gram*, *mung* (Hindi), and *mung bean*. The freshly germinated seeds are the "bean sprouts" widely used in oriental dishes. The dried seeds are edible when boiled, and the young pods are cooked as a vegetable. The species is also sometimes used as a cover crop or a green manure.

AVAILABLE COLLECTIONS: VANUA LEVU: THAKAUNDROVE: Wainigata Station, near Savusavu, DA 12035, 12036.

5. *Vigna reflexo-pilosa* Hayata in J. Coll. Sci. Imp. Univ. Tokyo **30** (1): 82. 1911; Verdcourt in Kew Bull. **24**: 560. 1970; Tateishi in Sci. Rep. Tohoku Imp. Univ., Ser. 4, Biol. **38**: 347. fig. 1 (9), 2 (4), 3 (6). 1984.

Phaseolus mungo sensu A. Gray, Bot. U. S. Expl. Exped. 1: 449. 1854; Seem. Viti, 435. 1862, Fl. Vit. 61. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 154. 1890; non L.

"*Neuranthus subspicatus* Benth." sensu Seem. in Bonplandia **9**: 255. 1861.

Phaseolus aureus sensu Yuncker in Bishop Mus. Bull. **220**: 149. 1959; non Roxb.

A scandent plant, often with subligneous stems, occurring in thickets or open forest from near sea level to an elevation of a few hundred meters. The stems, petioles, and peduncles are copiously pilose with strongly retrorse, fulvous hairs (1-) 1.5-3 mm. long. The stipules are 10-12 \times 3-4 mm., the stipels 2-6 mm. long, the petiolules 3-6 mm. long, and the leaflet blades 8.5-14 \times 5-10.5 cm., the lateral ones often notched on lower margin. The inflorescences have peduncles 8-30 cm. long and short, few-flowered rachises 3-5 cm. long, with uniformly bright yellow petals. The mature fruits (cf. Walker, Fl. Okinawa S. Ryukyu Isl. 596. 1976) are said to be reflexed or pendulous, 5-6 cm. \times 4-5 mm., dark brown to blackish, becoming scabridulous (Hayata, 1911), with blackish, mottled seeds.

TYPIFICATION: The type is *Kawakami & Mori 1767* (**TI HOLOTYPE**), collected Oct. 9, 1906, at Kishiri, Kagi (cited by Tateishi, 1984, as Chiayi: Kuetsuling), Taiwan.

DISTRIBUTION: Japan (rare in Kyushu), Ryukyu Islands, and Taiwan, southward and eastward into Malasia (Philippines, Sumatra, Java, Timor, New Guinea) to Australia, New Caledonia, Fiji, and presumably Tonga and Samoa. The Samoan record is based on the U. S. Exploring Expedition fragment cited by Gray (1854), the Tongan record on the Barclay specimen listed by Seemann (1865). Both of these records require verification, but in view of the collection dates it seems unlikely that either represents *Vigna mungo* or *V. radiata*.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Hills inland from Lautoka, *Greenwood 367*. TAILEVU: Hills east of Wainimbuka River, vicinity of Wailotua, *Smith 7249*; Waisere Creek, Vungalei (old Tikina name, now southern Verata Tikina), *DA 2680*. TAVEUNI: *Seemann 117*. FIJI without further locality, *U. S. Expl. Exped.* (fragmentary material).

The occurrence in Fiji of an indigenous member of the *mung* group had not been noted prior to the revisionary studies of Tateishi, who has identified *Seemann 117* (κ) and *Greenwood 367* (κ) as *Vigna reflexo-pilosa*. Since *V. mungo* and *V. radiata* seem to be comparatively recent (i. e. not prior to the early 1900's) introductions into Fiji and adjacent archipelagoes and are scarcely (and probably evanescently) naturalized, it seems probable that earlier-collected specimens of this immediate relationship represent *V. reflexo-pilosa*, as well as more recent specimens that seem definitely indigenous.

In considering the *mung* group I have been aided by helpful comments of B. Verdcourt and Y. Tateishi, although neither is responsible for my suggestion that the range of *V. reflexo-pilosa* extends into Tonga and Samoa.

6. *Vigna unguiculata* (L.) Walp. Rep. Bot. Syst. 1: 779. 1842; Verdcourt in Kew Bull. 24: 542. 1970, in Fl. Trop. E. Afr. Leg. Papil. 642. 1971; Smartt, Trop. Pulses, 25. 1976; Maréchal in Boissiera 28: 191. 1978; Verdcourt, Man. New Guinea Leg. 526. 1979.

Erect or twining annuals (the cultivated subspecies) or perennials, cultivated and perhaps rarely naturalized near sea level. The stems are glabrous or sometimes minutely pilose with stiff hairs, and the stipules are medifixed, 8–25 mm. long. The leaflet blades are ovate or rhomboid, usually 6–16 × 4–11 cm., entire or sometimes inconspicuously lobed, acuminate to subacute, and glabrous or sparsely pilose on both surfaces. The inflorescences are 2–several-flowered and often long-pedunculate, the calyx lobes being acuminate and often longer than the tube. The petals are white or greenish, tinged with yellow, blue, or purple, the standard being suborbicular and usually 1.5–3 cm. in diameter. The fruits are linear-cylindric, in our subspecies 7.5–100 cm. long and 3–11 mm. broad, glabrous, and sometimes minutely verruculose, with seeds white to red or black, often black- or brown-mottled, oblong or reniform, with the hilum 1, 3–1/2 the longest dimension and the rim-aril slightly developed.

DISTRIBUTION: Tropical Africa, doubtless the place of origin of the species in its broad sense; various subspecies and cultivars are now grown throughout the warmer parts of the world. The date of introduction of *Vigna unguiculata* into Fiji is uncertain, as no synonyms appear in the earlier literature; however, such an introduction could well have been made by European settlers in the nineteenth century.

LOCAL NAME AND USES: *Cow pea* is a collective name for all the subspecies. The cultivated variants produce pods which when young are cooked and used as vegetables, and the cooked ripe seeds are also edible. No Fijian herbarium vouchers are available, but cultivars are to be seen in local gardens.

The three well-known cultivated taxa of *Vigna* sect. *Catiang* are known to cross and to form fully fertile hybrids; following Verdcourt and some earlier students they are here treated as subspecies, probably derived from a wild Old World plant with narrow, blackish, dehiscent fruits. The ancestral plant may well be the wild subsp. *dekindtiana* (Harms) Verdcourt (cf. Verdcourt in 1970 and 1971, cited above). Maréchal (1978) groups all the cultivated forms under his subsp. *unguiculata*, referring the three well-known forms to "cultigroupes" (cv-gr.) and recognizing three additional subspecies.

KEY TO SUBSPECIES OCCURRING IN FIJI

Spreading, suberect, or erect annuals, sometimes twining, usually 15–80 cm. high; fruits less than 30 cm. long, mostly indehiscent but sometimes dehiscent, hard and firm, not inflated when young.
Fruits (10–) 20–30 cm. long, pendent even when young; seeds usually 6–10 mm. long.

6a. subsp. *unguiculata*
Fruits 7.5–13 cm. long, erect or ascending; seeds usually 5–6 mm. long. 6b. subsp. *cylindrica*
Twining annuals climbing to 2–4 m.; fruits 30–100 cm. long, pendent, indehiscent, more or less inflated and flabby when young; seeds elongate-reniform, usually 8–12 mm. long. . . . 6c. subsp. *sesquipedalis*

6a. **Vigna unguiculata** subsp. **unguiculata**; Verdcourt in Kew Bull. **24**: 543. 1970, Man. New Guinea Leg. 526. 1979.

Dolichos unguiculatus L. Sp. Pl. 725. 1753.

Dolichos sinensis L. Herb. Amb. 23. 1754, Cent. II. Pl. 28. 1756.

Vigna sinensis Hassk. Cat. Pl. Hort. Bogor. 279. 1844; J. W. Parham, Pl. Fiji Isl. 77. 1964, ed. 2. 119. 1972; Purseglove, Trop. Crops, Dicot. 322. fig. 51. 1968; Smartt, Trop. Pulses, 78. fig. 2.16, 2.18 (14). 1976.

The cultivated subspecies with fruits usually 20–30 cm. long and pendent even when young, the seeds usually 6–10 mm. long; cultivated and said to be rarely naturalized.

TYPIFICATION: For *Dolichos unguiculatus* Linnaeus cited only his *Hortus Upsaliensis*, the type being a specimen grown in the Uppsala Botanic Garden from seeds received from Barbados. The binomial *Dolichos sinensis* was taken directly from Rumph. Herb. Amb. **5**: 375. t. 134. 1747.

LOCAL NAMES: *Cow pea*; *barbati* (Hindi).

6b. **Vigna unguiculata** subsp. **cylindrica** (L.) Eselt. in Hedr. Veg. New York **1** (2): 11. 1931; Verdcourt in Kew Bull. **24**: 544. 1970, in Fl. Trop. E. Afr. Leg. Papil. 644. 1971, Man. New Guinea Leg. 526. 1979.

Phaseolus cylindricus L. Herb. Amb. 23. 1754.

Dolichos catjang Burm. f. Fl. Ind. 161. 1768.

Vigna catjang Walp. in Linnaea **13**: 533. 1839; Greenwood in Proc. Linn. Soc. **154**: 97, as *V. catjang*. 1943.

Vigna unguiculata sensu Purseglove, Trop. Crops, Dicot. 322. 1968; Smartt, Trop. Pulses, 77. 1976; non sensu str.

The cultivated subspecies with fruits usually 7.5–13 cm. long, erect or ascending, with seeds 5–6 mm. long, cultivated only. The only record of the *catjang* in Fiji is that of Greenwood (1943, cited above), but its presence was also implied by Parham in 1964 by his citation of *Vigna catjang* as a synonym of *V. sinensis* (i.e. subsp. *unguiculata*).

TYPIFICATION: Both *Phaseolus cylindricus* and *Dolichos catjang* were based on *Phaseolus minor* Rumph. Herb. Amb. **5**: 383. t. 139, fig. 1. 1747.

LOCAL NAMES: *Catjang*; *catjang cow pea*.

6c. **Vigna unguiculata** subsp. **sesquipedalis** (L.) Verdcourt in Davies, Fl. Turkey **3**: 266. 1970, in Kew Bull. **24**: 544. 1970, Man. New Guinea Leg. 527. 1979.

Dolichos sesquipedalis L. Sp. Pl. ed. 2. 1019. 1763.

Vigna sesquipedalis Fruw. Anbau Hülsenfr. 254. 1898; Purseglove, Trop. Crops, Dicot. 322. fig. 50. 1968;

Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 162. 1972; J. W. Parham, Pl. Fiji Isl. ed. 2. 120. 1972; Smartt, Trop. Pulses, 78. fig. 2.15. 1976.

The cultivated subspecies with twining plants and with pendent fruits 30–100 cm. long, more or less inflated and flabby when young, and with elongate-reniform seeds usually 8–12 mm. long; cultivated only.

TYPIFICATION: A precise typification has not been noted by me.

LOCAL NAMES: *Yard-long bean*; *long bean*; *asparagus bean*.

7. **Vigna marina** (Burm.) Merr. Interpret. Rumph. Herb. Amb. 285. 1917; Christophersen in Bishop Mus. Bull. **128**: 103. 1935; Greenwood in Proc. Linn. Soc. **154**:

97. 1943; Yuncker in Bishop Mus. Bull. **178**: 66. 1943, in op. cit. **220**: 150. 1959; J. W. Parham in Dept. Agr. Fiji Bull. **35**: 93. 1959, Pl. Fiji Isl. 77. 1964, ed. 2. 119. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 161. 1970; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 626. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 38, 39, 56. 1972; St. John in Phytologia **36**: 369. 1977; Maréchal in Boissiera **28**: 166. 1978; Verdcourt, Man. New Guinea Leg. **520**. fig. 127. 1979.

Phaseolus marinus Burm. Index Herb. Amb. (17). 1755.

Dolichos luteus Sw. Nov. Gen. & Sp. Prodr. 105. 1788.

Vigna lutea A. Gray, Bot. U. S. Expl. Exped. **1**: 452. 1854; Seem. in Bonplandia **9**: 255. 1861, Viti, 435. 1862, Fl. Vit. 62. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 154. 1890.

A prostrate, scrambling, or climbing perennial herb, often locally abundant at sea level and slightly upward, on beaches and sand dunes, in beach and coastal thickets, and along river banks and roadsides. The stems may become several meters long, being at first pilose but soon glabrate; the stipules are ovate, 2–3 mm. long, obscurely bilobed at base, obviously nerved, and early caducous. The leaflet blades are rhomboid-elliptic to obovate, usually 4–10.5 × 3–8 cm., rounded to emarginate at apex, inconspicuously appressed-pilose on both surfaces but soon glabrate. The inflorescences are often long-pedunculate, and the petals and filaments are pale to bright yellow, the standard being obovate and usually 12–14 mm. in diameter. The fruit is green, turning brown, linear-oblong, slightly curved, inflated, usually 4–8 cm. long and 5–7 mm. broad, and slightly contracted between the seeds, which are 2–10, yellow- to red-brown, and up to 7 × 6 × 5 mm., with an oblong hilum and an undeveloped rim-aril. Flowers and fruits seem to occur throughout the year.

TYPIFICATION: *Phaseolus marinus* is typified by *Phaseolus maritimus* Rumph. Herb. Amb. **5**: 391. *t.* 141, fig. 2. 1747, *Dolichos luteus* by a specimen from Jamaica presumably in the Swartz collection. The synonymy seems universally accepted.

DISTRIBUTION: Pantropical. More than 30 Fijian collections are at hand.

LOCAL NAMES AND USES: Fijian names for the *beach bean* are *ndrautolu*, *tokatolu*, and *wa vue*. The plant is occasionally used for fodder in the outlying islands, and its leaves are reputed to be part of a concoction sometimes used for headaches and more vague illnesses.

REPRESENTATIVE COLLECTIONS: YASAWAS: YASAWA: Nambukeru Village, *Weiner 231*. VITI LEVU: MBA: Lautoka, *Greenwood 141*. NANDRONGA & NAVOSA: Singatoka, *Greenwood 141A*. SERUA: Navua, *Parks 20389*. TAILEVU: Naingani Island, *DA 3367*. REWA: Nukulau Island, *Barclay 3440*; Makaluva Island, *DA 11787*. MBENGGGA: Rukua Beach, *DA 6046*. KANDAVU: Namalata isthmus region, *Smith 24*. OVALAU: Vicinity of Thawathi, *Smith 8098*. KORO: East coast, *Smith 1089*. NGAU: Shore of Herald Bay, vicinity of Sawaieke, *Smith 7936*. VANUA LEVU: MATHUATA: Lambasa, *Greenwood 141B*. THAKAUNDROVE: Nasinu, Natewa Bay, *DA 16845*. TAVEUNI: *Seemann 121*. TOTOYA: *Bryan 352*. VANUA MBALAVU: Near Sawana Village, *Garnock-Jones 1075*. LAKEMBA: Near Tumbou Jetty, *Garnock-Jones 790*. ONGEA NDRIKI: *Bryan 409*.

8. *Vigna adenantha* (G. F. W. Meyer) Maréchal, Mascherpa, & Stainier in Taxon **27: 202. 1978; Maréchal in Boissiera **28**: 229. 1978.**

Phaseolus adenanthus G. F. W. Meyer, Prim. Fl. Esseq. 239. 1818; Drake, Ill. Fl. Ins. Mar. Pac. 153. 1890; Christophersen in Bishop Mus. Bull. **128**: 105. 1935; Greenwood in Proc. Linn. Soc. **154**: 96. 1943; Yuncker in Bishop Mus. Bull. **220**: 149. 1959; J. W. Parham, Pl. Fiji Isl. 75. 1964, ed. 2. 115. 1972; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 615. 1971, Man. New Guinea Leg. 511. 1979.

Phaseolus truxillensis H. B. K. Nova Gen. et Sp. **6**: 451. 1824; Seem. in Bonplandia **9**: 255. 1861, Viti, 435. 1862, Fl. Vit. 61. 1865.

Phaseolus rostratus Wall. Pl. Asiat. Rar. **1**: 50. *t.* 63. 1830; A. Gray, Bot. U. S. Expl. Exped. **1**: 449. 1854; Seem. Viti, 435. 1862.

A perennial climbing or sprawling herb found from near sea level to an elevation of about 600 m. in open grassland, often in dry areas, and also in thickets along forest

stems. The stems attain a length of 4 m. and root at the nodes; the stipules are oblong-ovate, truncate at base, conspicuously nerved, and usually 3–5 mm. long. The leaflet blades are ovate to rhomboid, usually 5–9 × 3–6 cm., obtuse to acute and mucronulate at apex, sparsely appressed-pilose on both surfaces with stiff hairs, and often with conspicuously reticulate venation. The inflorescences are densely 6–12-flowered and sometimes long-pedunculate; the petals are whitish, tinged with pale pink or purplish blue, with the suborbicular standard 1.5–2.5 cm. in diameter and the keel about 5 cm. long, spirally incurved for 2–3 turns. The broadly linear fruits, usually 8–14 cm. × 7–14 mm., bear 9–15 dark reddish brown seeds up to about 7 × 5 × 3 mm. with a small white hilum. Our material bore flowers between April and October, fruits in May and June.

TIPOFIKADO I NOMEKLATURO: *Phaseolus adenanthus* is typified by *Rodschied* (GOETZ HOLOTYPE), collected along the Essequibo River in Guyana. The type of *P. truxillensis*, presumably collected by Humboldt and Bonpland and deposited at P or B, was obtained near Trujillo, Peru. For *P. rostratus* Wallich cited *Phaseolus alatus* Roxb. (Hort. Beng. 54, nom. nud. 1814; non L.) (Roxburgh's name was later published in Fl. Ind. ed. 2. 3: 288. 1832). The type of Wallich's species may have been a Roxburgh collection from Bengal, or perhaps his beautiful illustration should be considered the type. These names are only a few of the many now referred by specialists to *Vigna adenantha*.

DISTRIBUCIO: Pantropical; there is no sound evidence that the occurrence of *Vigna adenantha* in many Pacific archipelagoes was due to human agency, as often implied.

LOKALA NOME: The only recorded name is *wandoka* (Smith 4491).

AVAILABLA KOLEKTO: VITI LEVU: MBA: Lautoka, *Greenwood* 389, 799; vicinity of Nalotawa, eastern base of Mt. Evans Range, *Smith* 4491. NAITASIRE: Nasongu, Wailoa River, *DA* 15306; Vunimbua Hill, Nanduruloulou, *DA* 5630. TAILEVU: Waisere Creek, *DA* 2679. REWA: Nukulau Island, *Barclay* 3436. KANDAVU: Southern side of island, *Seemann* 116. OVALAU: U. S. *Expl. Exped.* VANUA LEVU: THAKAUNDROVE: Wainigata Station, near Savusavu, *DA* 12013.

44. *Macroptilium* Urb. Symb. Antill. 9: 457. 1928; Hutchinson, Gen. Fl. Pl. 1: 437. 1964; Verdcourt in Kew Bull. 24: 523. 1970; Maréchal in Boissiera 28: 151. 1978; Verdcourt, Man. New Guinea Leg. 504. 1979.

Phaseolus sect. *Macroptilium* Benth. Comment. Leg. Gen. 76. 1837.

Erect, climbing, or creeping herbs, annual or perennial, without uncinat hairs, the stipules strongly nerved, not prolonged below point of attachment; leaves pinnately trifoliolate (as in our species), rarely unifoliolate, stipellate, the leaflet blades occasionally lobed; inflorescences axillary or terminal, pseudoracemose, long-pedunculate, the flowers 2–several at slightly swollen nodes along rachis, the bracts caducous, the pedicels shorter than or subequal to calyx; calyx tube narrowly campanulate, 5-lobed, the lobes acute, equal or the lowest one much reduced; petals (white to) crimson to dark blackish purple, the standard obovate or suborbicular, reflexed, with small reflexed auricles at base of limb, without median callosities, the wings suborbicular, longer than standard and keel, auricled below base of limb, the wings and keel petals long-clawed, the claws partly adnate to staminal tube, the keel with a transverse fold, twisted; stamens 10, the filaments of 9 joined in a tube, the vexillary filament free, the anthers uniform; ovary sessile, the ovules few–many, the style in its thickened part, just above junction with tenuous part, abruptly curved through about 90°, toward apex narrowed, slightly curved, and introrsely bearded, resembling a squarish hook, the stigma capitate, subintrorse; fruits reflexed, cylindrical or compressed, straight or falcate, narrow, dehiscent, not septate, the style caducous, the seeds small, few–many, the hilum short.

LECTOTYPE SPECIES: *Macroptilium lathyroides* (L.) Urb. (*Phaseolus lathyroides* L.) (vide Urban, 1928, cited above).

DISTRIBUTION: Tropical and subtropical America, with 12–20 species. At least two species are widely cultivated and sometimes naturalized in the Old World, as in Fiji.

KEY TO SPECIES

- Plant creeping, the young stems copiously pilose, rooting at nodes; stipules ovate, 3–5 mm. long; leaflet blades ovate to rhomboid, often inconspicuously laterally lobed, copiously white-subsericeous beneath; inflorescences with peduncles 10–25 cm. long and with comparatively few flowers and fruits; petals dark red, purple, or almost blackish; seeds 12–15. 1. *M. atropurpureum*
- Plant suberect or occasionally subsucculent, the stems sparsely pilose; stipules lanceolate, 5–6 mm. long; leaflet blades narrowly elliptic to ovate-lanceolate, not lobed, sparsely pilose beneath at least at maturity; inflorescences with peduncles 15–45 cm. long, the flowers and fruits copious; standard maroon to purple, the wings and keel petals greenish, red- or white-tinged; seeds 18–30. 2. *M. lathyroides*

1. **Macroptilium atropurpureum** (DC.) Urb. Symb. Antill. 9: 457. 1928; Maréchal in Boissiera 28: 153. 1978; Verdcourt, Man. New Guinea Leg. 505. 1979.

Phaseolus atropurpureus DC. Prodr. 2: 395. 1825; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 157. 1970; J. W. Parham, Pl. Fiji Isl. ed. 2. 115. 1972.

A trailing or creeping perennial herb, cultivated only from near sea level to about 200 m. The young stems are copiously white-spreading-pilose, rooting at nodes, and the ovate stipules are acuminate and 3–5 mm. long. The leaflet blades, ovate to rhomboid, are 2–7 × 1.5–5 cm., obtuse to acute and mucronulate at apex, copiously white-subsericeous beneath, and with 1 or 2 inconspicuous lateral lobes. The few-flowered inflorescences have peduncles 10–25 cm. long, and the petals are 1.5–2.5 cm. long, dark red to blackish purple. The fruits are about 7–9 cm. long and 4.5 mm. broad, appressed-pilose, and beaked, with 12–15 oblong-ellipsoid, pitted, brown, black-spotted seeds about 4 mm. long. Our material was flowering between January and June, fruiting in January and May.

TYPIFICATION: The type was collected in mountains of Chilapa, Guerrero, Mexico (HOLOTYPE probably at G); de Candolle added: “fl. mex. icon. ined.”

DISTRIBUTION: Tropical and subtropical America from southern U. S. to Peru, now widely cultivated and often naturalized elsewhere. The species was introduced into Fiji from Queensland about 1960; although no naturalized material is at hand, it has apparently been successfully established.

LOCAL NAME AND USE: The widely applied name *siratiro* is used in Fiji, the species having been introduced as a potential cover crop and pasture legume.

AVAILABLE COLLECTIONS: VITI LEVU: Mba: Mba closed area, DA 13184 (FDA 15318). NANDRONGA & NAVOSA: Agricultural Station, Nathotholevu, near Singatoka, DA 12319 (FDA 15313). RA: Colonial Sugar Refining Co., Yanggara, DA 12314. VANUA LEVU: MATHUATA: District Farm Northern, Seangangga, DA 16681.

2. **Macroptilium lathyroides** (L.) Urb. Symb. Antill. 9: 457. 1928; Verdcourt, Man. New Guinea Leg. 505. fig. 124. 1979.

Phaseolus lathyroides L. Sp. Pl. ed. 2. 1018. 1763; J. W. Parham in Dept. Agr. Fiji Bull. 35: 93. fig. 45, e-h. 1959, Pl. Fiji Isl. 75. 1964, ed. 2. 116. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 158. 1970.

Phaseolus semierectus L. Mant. Pl. 100. 1767; Greenwood in Proc. Linn. Soc. 154: 96. 1943; Yuncker in Bishop Mus. Bull. 220: 149. 1959.

Macroptilium lathyroides var. *semierectum* Urb. Symb. Antill. 9: 457. 1928; Maréchal in Boissiera 28: 152. 1978.

An annual or biennial, erect, branching herb to 1.5 m. high, occasionally subsucculent, cultivated but also an abundant weed at elevations from near sea level to 600 m., especially on Viti Levu, along roadsides, on waste land, in open fields, pastures, canefields, and in open places along streams and rivers. The stems are sparsely appressed-pilose and often subligneous toward base; the stipules are lanceolate and 5–6 mm. long. The lanceolate- to elliptic-ovate leaflet blades are 2.5–8 × 1–3.5 cm., not

lobed, sparsely appressed-pilose beneath, and acute at apex. The inflorescences have peduncles 15–45 cm. long and bear abundant flowers and fruits. The petals are about 1.5 cm. long, the standard being maroon to purple or pink, the wings and keel petals greenish, tinged with red or white. The linear fruits, reddish brown at maturity, are appressed-pilose, 6–10 cm. long, about 3 mm. broad, and with valves becoming strongly twisted. The seeds are 18–30, oblong, 3–3.5 mm. long, reddish brown to black and brown-blotched. Copious flowers and fruits occur throughout the year.

TIPIFICATION AND NOMENCLATURE: In 1763 Linnaeus cited Browne and Sloane references of Jamaican plants, and in 1767 he gave several older references. In much of the recent literature *Phaseolus semierectus* is relegated to direct synonymy, but Maréchal (1978) agrees with Urban in maintaining it as the commonly cultivated variety; if this opinion is followed the plant so abundant in the Pacific should be referred to var. *semierectum* (L.) Urb.

DISTRIBUTION: Tropical America, now widely cultivated and naturalized throughout the tropics and subtropics. The species was apparently first observed in Fiji by Greenwood about 1920, but it has frequently been introduced more recently and is now well established as a pasture legume as well as a common weed in drier areas. About 35 Fijian collections have been examined.

LOCAL NAMES AND USES: The widely used names *phasey bean* and *pea bean* have been adopted in Fiji. The species is a pasture legume apparently not relished by cattle; however, more palatable strains have now been introduced from Australia.

REPRESENTATIVE COLLECTIONS: VITI LEVU: Mba: Lautoka, *Greenwood 163*; Korovuto, Nandi, *DA 10699*; vicinity of Nalotawa, eastern base of Mt. Evans Range, *Smith 4501*; Tavua, *DA 9489*. NADRONGA & NAVOSA: Keiyasi, Singatoka River, *DA 10170*; Lawangga, Singatoka, *DA 9767*. RA: Colonial Sugar Refining Co., Yanggara, *DA 12313*; Penang, *Greenwood 163A*; Pasture Seed and Production Farm, Ndombuilevu, *DA 9551*. NAITASIRE: Between Suva and Nasinu, *Gillespie 3667.2*; Plant Introduction and Quarantine Station, Nanduruloulou, Pl. Introduction no. *FDA 15370*. TAILEVU: Queen Victoria School farm, Matavatathou, *DA 9941*. REWA: Suva, *DA 12304*; Suva Point, *DA 7486*. VANUA LEVU: MATHUATA: Lambasa, *Greenwood 163C*; Namara road, Lambasa, *DA 10453*.

45. *PHASEOLUS* L. Sp. Pl. 723. 1753; Hutchinson, Gen. Fl. Pl. 1: 436. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 613. 1971; Maréchal in Boissiera 28: 133. 1978; Verdcourt, Man. New Guinea Leg. 508. 1979.

Erect, prostrate, or climbing herbs or shrubs, with uncinat hairs, the stipules striate, persistent, not prolonged below point of insertion; leaves pinnately trifoliolate (as in all our species) or rarely unifoliolate, stipellate; inflorescences axillary, racemiform, the flowers fasciculate at inconspicuous nodes along rachis, the bracts and bracteoles subsistent (at least to anthesis); calyx bilabiate, the 2 upper lobes forming an emarginate or bifid lip, the lower lip 3-lobed; standard suborbicular, auriculate, often reflexed and with 2 appendages at side of claw and with a transverse constriction above claw, the wings obovate or oblong, often spiralled and broadened or cucullate at apex, somewhat adherent to keel, the keel often narrow and elongated, the apex beaked and spiralled in 1–5 complete turns; stamens 10, the filaments of 9 connate into a sheath, the vexillary filament free, the anthers uniform or 5 dorsifixed alternating with 5 basifixed; ovary sessile, oblong to linear, the ovules 2–many, the style tenuous proximally, filiform, flexible, the apical part cartilaginous and thickened, curved through more than 360°, glabrous or introrsely pilose distally, the stigma oblique, subterminal, or terminal, not penicillate; fruits linear or oblong, sometimes falcate, compressed or subcylindric, dehiscent, not septate, the style caducous, the seeds 2–many, oblong or reniform, the hilum oblong, short, subcentral.

LECTOTYPE SPECIES: *Phaseolus vulgaris* L. (vide Britton & Brown, Ill. Fl. N. U. S. ed. 2: 2: 422. 1913), one of Linnaeus's original eleven species.

DISTRIBUTION: Cooler parts of tropical and subtropical America, extending northward into eastern temperate areas, as now circumscribed (cf. Lackey in Adv. Leg. Syst. 324. 1981) with about 50 species, among which are three of the world's most important crop plants, now widely cultivated. These three species are grown in Fiji. These are all members of sect. *Phaseolus*, characterized by having the pedicels longer than the calyx, the calyx lobes no longer than the tube, the standard short-clawed and thickened in the middle, and the wings longer than the standard and keel.

KEY TO SPECIES

- Fruits falcate- or lanceolate-oblong, usually $5-12 \times 1.5-2.5$ cm., with (2-) 3 or 4 seeds; inflorescences few-many-flowered, the peduncle up to 30 cm. long; bracteoles comparatively small, 1.5-2 mm. long, shorter than calyx; petals usually whitish (standard to purplish; wings white; keel greenish), the standard up to 7×10 mm. 1. *P. lunatus*
- Fruits linear-lanceolate or elongate, $8-40 \times 1-2$ cm., usually with 9-12 seeds; bracteoles 3-6 mm. long; petals variously colored, the standard often more than 10 mm. in diameter.
- Inflorescences shorter than leaves, with 1-3 flowers, the peduncle not exceeding 5 cm. in length; bracteoles conspicuous, 5-6 mm. long, exceeding calyx; petals white, yellowish, pink, or purplish, the standard usually 9-12 mm. in diameter; fruits linear-lanceolate, usually $8-20 \times 1-1.5$ cm. ... 2. *P. vulgaris*
- Inflorescences with 6 or more pairs of flowers, the peduncle commonly more than 6 cm. long; bracteoles 3-5 mm. long, shorter than or subequal to calyx; petals bright scarlet or white or variegated red and white, 15-25 mm. long; fruits elongate, usually $10-40 \times 1-2$ cm. 3. *P. coccineus*

1. ***Phaseolus lunatus*** L. Sp. Pl. 724. 1753; J. W. Parham, Pl. Fiji Isl. 75. 1964, ed. 2. 116. 1972; Purselove, Trop. Crops. 296. fig. 45. 1968; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 615. fig. 95. 1971; Smartt, Trop. Pulses, 71. fig. 2.12, 2.18 (9). 1976; Maréchal in Boissiera 28: 145. 1978; Verdcourt, Man. New Guinea Leg. 513. fig. 126. 1979; Henty in Papua New Guinea Dept. Forests Bull. 12: 94. pl. 32. 1980.

Perennial or biennial climber, sometimes shrubby, with stems up to 4 m. long, cultivated from near sea level to about 800 m. and also locally naturalized in fairly dry areas or sometimes in woods along streams. The leaflet blades are ovate to rhomboid or lanceolate, usually $5-12 \times 3-9$ cm., acute to acuminate, sparsely pilose to glabrous. The inflorescences bear few-many flowers (often 4 per rachis node) and have peduncles up to 30 cm. long; the bracts are lanceolate and persistent, about 1.5 mm. long, and the bracteoles are elliptic to ovate, 1.5-2 mm. long. The standard is white to pale rose or purplish, rounded-oblong, up to 7×10 mm., the wings are white, and the keel is greenish, 10-14 mm. long, and spirally incurved 1.5-2 turns. The fruits are falcate- or lanceolate-oblong, compressed, apiculate, glabrous or pilose, usually $5-12 \times 1.5-2.5$ cm. and with (2-) 3 or 4 seeds which are mostly white or purple but very variable in color, reniform, $10-30 \times 8-17 \times 5-8$ mm., with a whitish hilum 2.5-4 mm. long.

TYPIFICATION: The only reference given by Linnaeus is: "*Berg. viadr. 99. Habitat in Benghala.*" Verdcourt (1971, cited above) states this as "*Phaseolus benghalensis scandens* . . . *striato* of Bergen, Cat. Stirp. Hort. Acad. Viadr. compl.: 99 (1744)."

DISTRIBUTION: Tropical or subtropical America, found in Peruvian deposits as old as 6000 B. C., widely distributed in post-Columbian times and now cultivated throughout the tropics and subtropics and frequently naturalized. The date of its introduction into Fiji is uncertain; it is now completely naturalized at least in western Viti Levu. The cultivated forms fall into var. *lunatus*, one of two varieties recognized by Maréchal (1978).

LOCAL NAMES AND USES: Commonly known in Fiji as *lima bean* or *sem* (Hindi). Elsewhere, names commonly used for the *lima bean* are *butter bean*, *sieva bean*, *haricot bean*, *Madagascar bean*, and *Burma bean*. The leaves and young pods are edible as a vegetable, but the species is primarily grown for its dried beans. It includes numerous cultivars, most of them with a poisonous principle that must be dissipated

by proper cooking. The extent of its use in Fiji or of agricultural introductions is not apparent from available records.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Loloti, in mountains near Lautoka, *Greenwood 284, 285A*; slopes of escarpment north of Nandarivatu, *Smith 6292*. NANDRONGA & NAVOSA: Singatoka, on trees near shore, *Greenwood 284B*.

2. *Phaseolus vulgaris* L. Sp. Pl. 723. 1753; Yuncker in Bishop Mus. Bull. 178: 65. 1943; J. W. Parham, Pl. Fiji Isl. 76. 1964, ed. 2. 116. 1972; Purseglove, Trop. Crops, Dicot. 304. fig. 47. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 158. 1970; Verdcourt in Fl. Trop. E. Afr. Leg. Pabil. 614. 1971; Smartt, Trop. Pulses, 71. fig. 1.2, 2.13, 2.18 (10). 1976; Maréchal in Boissiera 28: 136. 1978; Verdcourt, Man. New Guinea Leg. 513. 1979.

An annual climbing or suberect herb, found near sea level and doubtless to higher settlements and villages, cultivated but not becoming naturalized. The leaflet blades are ovate to rhomboid, usually 8–15 × 5–10 cm., acuminate, often pilose. The inflorescences are shorter than the leaves, with 1–3 flowers, the peduncles not exceeding 5 cm. in length; the bracts are ovate and about 3 mm. long, the bracteoles more conspicuous and 5–6 mm. long. The petals are white, yellowish, pink, or purple, the standard oblate-oblong, usually 9–12 mm. in diameter, the wings with long claws 5–6 mm. long, and the keel spirally incurved and about 22 mm. long. The fruits are linear-lanceolate, usually 8–20 cm. long and 10–15 mm. broad, compressed, beaked, puberulent or glabrous, with (5–) 10–12 oblong-ellipsoid or reniform seeds 9–20 × 3–12 × 4–11 mm.

LECTOTYPIFICATION: Linnaeus listed several prior references, including one to his *Hortus Upsaliensis*, 213. 1745. The LECTOTYPE (cf. Verdcourt, 1971, cited above) may be taken as no. 899/1 (LINN), from a specimen cultivated at Uppsala.

DISTRIBUTION: Of American origin, known from Mexican deposits as early as 4900 B. C. In post-Columbian times it has become the most widely cultivated bean throughout the world. More than 500 varieties or cultivars have been developed, all falling into var. *vulgaris* of the two varieties recognized by Maréchal (1978). In Fiji the species was very probably used by European settlers in the nineteenth century.

LOCAL NAMES AND USES: In Fiji this often cultivated species seems to be known as *dwarf bean*, *kidney bean*, *French bean*, and *haricot bean*. Elsewhere it is additionally called *string bean*, *common bean*, *common haricot*, *salad bean*, *runner bean*, and *snap bean*. As a primary use of the *string bean* the immature pods are cooked as a vegetable, but the mature seeds are also used in a great variety of ways, and the leaves may be used as a potherb. Seeds are imported into Fiji annually.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Principal Agricultural Station, Koronivia, *DA 7464*. REWA: Suva, *DA 12399*.

3. *Phaseolus coccineus* L. Sp. Pl. 724. 1753; J. W. Parham, Pl. Fiji Isl. 75. 1964, ed. 2. 116. 1972; Purseglove, Trop. Crops, Dicot. 295. 1968; Smartt, Trop. Pulses, 70. 1976; Maréchal in Boissiera 28: 137. 1978; Verdcourt, Man. New Guinea Leg. 512. 1979.

An annual or perennial twining plant, occurring near sea level and doubtless upward in European settlements, cultivated but not naturalized. The stems are usually pilose and up to 4 m. long; the leaflet blades are ovate to rhomboid, usually 7.5–15 × 8–12 cm., acuminate, and pilose on both sides with minutely unciniate hairs. The inflorescences have 6 or more pairs of flowers, with a peduncle commonly exceeding 6 cm.; the bracteoles are 3–5 mm. long, shorter than or subequal to calyx. The petals are scarlet, sometimes white or variegated red and white, and 12–25 mm. long. The elongate fruits, 10–40 cm. long and 1–2 cm. broad, are densely pilose when young and roughened along margins, with up to about 9 seeds, these variable in color, white to

reddish to black or variously speckled, oblong, and 17–25 × 10–16 × 1–10 mm.

TYPIFICATION: Linnaeus gave references to Cornut (Canad. Pl. 184. 1635) and Morison (Pl. Hist. Univ. 2: 69. 1680).

DISTRIBUTION: Indigenous in Central America, and known from Mexican deposits that may date back to 7000 B. C., now widely cultivated as a crop throughout the world. Four subspecies are discussed by Maréchal (1978), the cultivated forms, with the largest seeds, falling into subsp. *coccineus*.

LOCAL NAME AND USES: The name used in Fiji, *scarlet runner bean*, seems well established for this species throughout the world. The tender young pods are cooked as a vegetable, and the dried seeds may also be cooked and eaten. The species is sometimes cultivated for its ornamental flowers. Seeds must be imported into Fiji annually.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRE: Viria, Meebold 16511 (sterile).

46. CAJANUS DC. Cat. Pl. Hort. Bot. Monspel. 85. 1813; Hutchinson, Gen. Fl. Pl. 1: 421. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Papol. 709. 1971, Man. New Guinea Leg. 537. 1979. Nom. cons.

Shrubs or subshrubs, the stipules small, caducous; leaves pinnately 3-foliolate, inconspicuously stipellate, the leaflet blades covered with small, yellow, resinous glands; inflorescences terminal and paniculate, also axillary and subcapitate-racemose, the pedicels long, the bracts caducous, the bracteoles lacking; calyx 5-lobed, the 2 upper lobes connate, bifid; petals subequal in length, the standard suborbicular, reflexed, auriculate at base, the wings obliquely obovate, the keel distally incurved; filaments of 9 stamens joined into a sheath, the vexillary filament free, the anthers uniform, dorsifixed; ovary subsessile, elongate, pilose, the ovules 2–8, the style thickened distally, flattened below stigma, not barbate, the stigma small, capitate; fruits linear-oblong, inflated, tardily dehiscent, scarcely septate within, the acumen persistent, the seeds 2–8, separated by oblique grooves on faces of pods, rounded, compressed, the hilum linear, the rim-aril small.

TYPE SPECIES: *Cajanus cajan* (L.) Huth (*Cytisus cajan* L.). It may be noted that ICBN (Sydney edition, 1983) continues to give Millspaugh as the first combining author, but ING (1979) corrects this to Huth, as was pointed out by Nicolson in Taxon 24: 390. 1975.

DISTRIBUTION: Pantropical, with two (or three?) species, one of which is widely cultivated and naturalized, as in Fiji.

1. *Cajanus cajan* (L.) Huth in Helios 11: 133, as *Cajan c.* 1893; Millsp. in Publ. Field Columbian Mus., Bot. Ser. 2: 53, as *Cajan c.* 1900; J. W. Parham, Pl. Fiji Isl. 72. 1964, ed. 2. 109. 1972; Purseglove, Trop. Crops, Dicot. 236. fig. 35. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 144. 1970; Verdcourt in Fl. Trop. E. Afr. Leg. Papol. 709. fig. 108. 1971; Nicolson in Taxon 24: 390. 1975; Smartt, Trop. Pulses, 54. fig. 2.5, 2.18 (17, 18). 1976; Verdcourt, Man. New Guinea Leg. 539. fig. 132. 1979.

Cytisus cajan L. Sp. Pl. 739. 1753.

Cajanus indicus Spreng. Syst. Veg. 3: 248, nom. illeg. 1826; Seem. in Bonplandia 9: 255. 1861, Viti, 435. 1862, Fl. Vit. 74. 1865; Greenwood in Proc. Linn. Soc. 154: 96. 1943.

A short-lived perennial shrub 1–4 m. high, found from sea level to not more than 100 m. in cultivation and also as a weed along roadsides, in canefields, and in cultivated areas. The stems are prominently ribbed and copiously short-golden-sericeous. The leaflet blades are elliptic to lanceolate, 3–10 × 1.5–3.5 cm., acute, soon glabrate above,

and finely silvery-pilose beneath. The long-pedunculate inflorescences are subequal to the leaves in length, and the calyx is fulvo-tomentose and glandular. The standard is 12–17 mm. in diameter, bright yellow, with reddish brown or crimson lines within and often flushed with brown to red without, the wings are yellow, and the keel is yellow-green. The nearly straight fruits are usually 4–10 cm. × 6–15 mm., stramineous, streaked with purplish black, pilose, and glandular; the compressed-globose seeds are up to 8 mm. in diameter, cream-colored to reddish or brown, and minutely pitted. Our specimens bore flowers between May and November, fruits between July and October.

TYPIFICATION: Linnaeus cited several prior references for *Cytisus cajan*, including his Fl. Zeyl. 354. 1747, selected by Verdcourt (1971, cited above) as the type. **LECTOSYNTYPES** are *Hermann* 2:76 and 3:30 (BM). *Cajanus indicus* is based on the same concept.

DISTRIBUTION: The species is assumed to have originated in Africa and in prehistoric times to have reached India, where it was improved by selection. Many cultivars have been developed in India and are sometimes grouped into two botanical varieties. Another assumption (cf. Lackey in Adv. Leg. Syst. 327. 1981) is that *Cajanus cajan* is merely a cultivated form of *Atylosia* which has evolved an erect habit, large seeds, and an inconspicuous rim-aril, probably in Asia. The two genera are very closely allied, but it would be disruptive to combine them under the older name, *Cajanus*.

LOCAL NAMES AND USES: Commonly known as *pigeon pea*, but other names used in Fiji are *Congo pea*, *red gram*, *arhar* (Hindi), and *dhal* (Hindi). Fijians call the plant *pi*, and *nggiringgiri* was recorded on Kandavu. The green seeds are eaten as a vegetable and are considered a good substitute for green peas. When ripe, the seeds are boiled and eaten as a pulse or made into *dhal*. The plants provide an excellent fodder and are sometimes used as a cover crop or a green manure. Seemann noted that in 1860 the species was only cultivated in Fiji, presumably for its edible seeds, but since then it has become a locally frequent weed.

AVAILABLE COLLECTIONS: VITI LEVU: Mba: Lautoka and vicinity, *Greenwood* 213, *DA* 10361; between Nandi and Namulomulo, *DA* 10281; Mba closed area, *DA* 14351; Kavuli, *DA* 9478. NANDRONGA & NAVOSA: Singatoka Valley road, *DA* 9142; Experiment Station, Singatoka, *DA* 5993. RA: Yanggara, *Greenwood* 213A. NAITASIRE: Plant Introduction and Quarantine Station, Nanduruloulou, *DA*, Jan. 23, 1952. TAILEVU: Mokani, *DA* 2734; near Ndravo, *DA* 2526. REWA: (without other locality), *Tothill* 136. KANDAVU: Western end of island, near Cape Washington, *Smith* 298. VANUA LEVU: MATHUATA: Vicinity of Lambasa, *DA* 9646, 10467. FIJI without further locality, *Seemann* 115.

47. *ATYLOSIA* Wight & Arn. Prodr. Fl. Ind. Orient. 257. 1834; Hutchinson, Gen. Fl. Pl. 1: 421. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 707. 1971, Man. New Guinea Leg. 540. 1979; Pedley in *Austrobaileya* 1: 378. 1981.

Erect or climbing herbs or shrubs, the stipules small; leaves pinnately (as in our species) or rarely subdigitately trifoliolate, estipellate, the leaflet blades with scattered resinous glands beneath; inflorescences axillary, racemose or subpaniculate or flowers fasciculate, the bracts caducous, the bracteoles lacking; calyx 5-lobed, the lobes unequal, the 2 upper ones joined into a bifid lip; petals yellow, persistent, the standard suborbicular, with inflexed auricles at base, the wings obovate to oblong, the keel slightly incurved; filaments of 9 stamens connate into a sheath, the vexillary filament free, the anthers uniform; ovary with 2–many ovules, the style incurved at middle, filiform or slightly thickened and glabrous distally, the stigma small, terminal; fruits oblong or linear, compressed, dehiscent, distinctly septate, the valves with transverse or oblique lines, the seeds 2–many, rounded or ovoid, the hilum central on shorter side of seed, with a well-developed rim-aril.

LECTOTYPE SPECIES: *Atylosia candollei* Wight & Arn., nom. illeg. (*Odonia trinervia* Spreng.) = *A. trinervia* (Spreng.) Gamble (vide Hutchinson, Gen. Fl. Pl. 1: 421. 1964).

DISTRIBUTION: Paletropical, with about 35 species, presumably introduced into Fiji and represented by a localized weed.

1. *Atylosia scarabaeoides* (L.) Benth. in Miq. Pl. Junghuhn. 242. 1852; Greenwood in Proc. Linn. Soc. **154**: 97. 1943, in J. Arnold Arb. **25**: 398. 1944; J. W. Parham in Dept. Agr. Fiji Bull. **35**: 92. fig. 46. 1959, Pl. Fiji Isl. 71. 1964, ed. 2. 109. 1972; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. **707**. fig. 107. 1971, Man. New Guinea Leg. **540**. fig. 134 (var. *scarabaeoides*). 1979; Reynolds & Pedley in *Austrobaileya* **1**: 421. 1981.

Dolichos scarabaeoides L. Sp. Pl. 726. 1753.

Atylosia scarabaeoides var. *scarabaeoides*; Reynolds & Pedley in *Austrobaileya* **1**: 421. 1981.

A perennial creeping or prostrate herb, forming thick mats, or climbing, at elevations from near sea level to 300 m. as a locally common weed along roadsides, on sand dunes, and in open fields and pastures. The slender stems are soft-spreading-pilose; the elliptic leaflet blades, usually 0.8–4 × 0.5–3 cm., are rounded to subacute at base and apex, sparsely pale-spreading-pilose and gland-dotted on both surfaces. The inflorescences are sessile or short-pedunculate, to 2.5 cm. long, few-flowered, with petals 8–10 mm. long, yellow, flushed with crimson or purple-veined, or the keel is green. The fruits are 1.5–2.5 cm. × 6–7 mm., hirsute with yellowish hairs, and with conspicuous, oblique septa; the 2–5 (–6) seeds are oblong, dark brown, and 4–5 × 2.5–3 × 1.5–1.8 mm. Flowers and fruits are found throughout the year.

TYPEFICTION: Of the two references given by Linnaeus, Verdcourt (1971, cited above) takes that to Fl. Zeyl. 282. 1747 as indicating the lectotypes. Three specimens from Ceylon, *Hermann* 1:34 and 2:60 (BM) and *Burman* (LINN 900.9) may be considered LECTOSYNTYPES.

DISTRIBUTION: Widespread throughout Asia and to Australia, introduced into Africa and elsewhere. Our material falls into var. *scarabaeoides*, with fewer-flowered, shorter racemes and more numerous seeds than var. *pedunculata* Reynolds & Pedley (1981, cited above). About 20 collections are at hand.

LOCAL NAMES AND USE: In the local Department of Agriculture the species is known as *tropical clover* or *peanut grass*. Presumably it was introduced about 1925 (from data in herbarium) as a pasture legume, but it is locally considered as of no value as fodder and is regarded as a weed, thus far apparently limited to Viti Levu.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Vicinity of Lautoka and hills inland, *Greenwood* 731, *DA* 10728; Nandi, *Greenwood* 731A; between Nandi and Namulomulo, *DA* 10280. NANDRONGA & NAVOSA: Thuvu, west of Singatoka, *Greenwood* 731C; Experimental Farm, Singatoka, *DA* 5974; Singatoka Valley near road to Nasauthoko, *DA* 9290 (*McKee* 2860). SERUA: (?): Nawai Ranch, *DA* 7389 (*L.3049*). RA: Yaggara, *Greenwood* 731B, *DA* 10749.

48. *FLEMINGIA* Roxb. ex Ait. f. Hort. Kew. ed. 2. **4**: 349. (Dec.) 1812; Rudd in *Taxon* **19**: 294. 1970; Verdcourt in *Kew Bull.* **25**: 146. 1971, in *Fl. Trop. E. Afr. Leg. Papil.* **805**. 1971, Man. New Guinea Leg. **545**. 1979. Nom. cons.

Lourea ("Luorea") Necker ex J. St.-Hil. in *Bull. Sci. Soc. Philom. Paris* **II**. **3**: 193. (Dec.) 1812. Nom. rejic. *Maughania* J. St.-Hil. in *Bull. Sci. Soc. Philom. Paris* **II**. **3**: 216. (Jan.) 1813.

Moghania J. St.-Hil. in *J. Bot. Agric.* **1**: 61, orth. var. (Jan.) 1813; Nooteboom in *Reinwardtia* **5**: 432. 1961; Hutchinson, *Gen. Fl. Pl.* **1**: 422. 1964.

Herbs or shrubs, erect, prostrate, or rarely climbing, the stipules striate, often caducous; leaves digitately trifoliolate (as in our species), rarely unifoliolate, estipellate, the leaflet blades covered with small glands especially on lower surface, often prominently nerved beneath; inflorescences axillary or terminal, racemiform or paniculate, usually many-flowered, the bracts sometimes broad and foliaceous, sometimes narrow, persistent or caducous, the bracteoles lacking; calyx 5-lobed, the lobes longer

than tube, usually glandular; standard oblong or elliptic, auriculate at base, the wings very narrow, obovate or oblong, often adherent to keel, the keel straight or incurved; filaments of 9 stamens connate into a sheath, the vexillary filament free, the anthers uniform; ovary subsessile, ellipsoid, the ovules 2, the style filiform, enlarged distally, glabrous, the stigma small, terminal; fruits oblong-ovoid, inflated, dehiscent, not septate, the style oblique, persistent, the seeds 1 or 2, globose, the hilum short, without a rim-aril.

LECTOTYPE SPECIES: *Flemingia strobilifera* (L.) Ait. f. (*Hedysarum strobiliferum* L.) (vide Rudd in Taxon 19: 297. 1970).

DISTRIBUTION: Paleotropical, with about 30 species, all Asian except for two in tropical Africa. One species is sparingly cultivated in Fiji.

1. **Flemingia macrophylla** (Willd.) Merr. in Philipp. J. Sci. 5(C): 130. 1910, Enum. Philipp. Fl. Pl. 2: 317. 1923; Verdcourt, Man. New Guinea Leg. 549. fig. 136. C. 1979.

Crotalaria macrophylla Willd. Sp. Pl. 3: 982. 1802.

Moghania macrophylla Kuntze, Rev. Gen. Pl. 1: 199. 1891; Nooteboom in Reinwardtia 5: 434. 1961; J. W. Parham, Pl. Fiji Isl. ed. 2. 114. 1972.

A shrub to 3.5 m. high, sparsely cultivated near sea level. The stems are ridged and appressed-white-pilose, the stipules lanceolate and sericeous. The elliptic-lanceolate leaflet blades are usually 5–20 × 1.5–10 cm., predominantly acuminate at apex, pale-sericeous on nerves on both surfaces, and with prominent, ascending secondary nerves. The racemiform inflorescences are subsessile, to 7 cm. long, with ovate-deltoid, densely sericeous bracts exceeding the buds but soon deciduous. The petals are pink to purple, greenish-blotched or -striped, the standard being 10–12 mm. long. The fruits are oblong, about 15 × 7 mm., short-pilose, gland-dotted, and with black seeds about 3 mm. broad. Our specimens were flowering in May and August.

TIPIFICATION: The type is no. 13260 in the Willdenow Herbarium (B), from India (Merrill, 1910, cited above).

DISTRIBUTION: Himalayas to India and Ceylon to China and into Malesia, but presumably not indigenous in New Guinea or Australia; cultivated in other areas.

USES: The species was probably introduced into Fiji during the present century as a potential pasture legume, but it is not utilized as such and apparently has not become naturalized, although it is sufficiently attractive to be sometimes considered an ornamental. In New Guinea it is sometimes cultivated to form shelter belts in tea plantations.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mba closed area, DA 14347. REWA: Suva, Meebold 16658.

49. **RHYNCHOSIA** Lour. Fl. Cochinch. 425, 460. 1790; Nooteboom in Reinwardtia 5: 438. 1961; Hutchinson, Gen. Fl. Pl. 1: 423. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 711. 1971, Man. New Guinea Leg. 551. 1979; Pedley in Austrobaileya 1: 378. 1981.

Herbs or subshrubs, climbing, prostrate, or rarely erect, the stipules ovate or lanceolate; leaves pinnately (as in our species) or rarely subdigitately trifoliolate, sometimes unifoliolate, with very small stipels or these lacking, the leaflet blades with resinous glands beneath; inflorescences axillary or terminal, racemiform or paniculate, rarely 1-flowered, the bracts often well developed but caducous, the bracteoles lacking; calyx 5-lobed, the lobes unequal, the 2 upper ones joined; petals often small, the standard ovate or suborbicular, with small auricles, glabrous or pilose without, the wings narrow, the keel incurved at apex; filaments of 9 stamens joined in a sheath, the vexillary filament free; ovary often tomentellous, the ovules (1 or) 2, the style long, slender and usually pilose proximally, incurved, distally somewhat flattened, stiffened,

and glabrous, the stigma small, terminal; fruits subcircular to narrowly oblong, compressed, often falcate, frequently glandular and tomentellous, dehiscent, not septate, the valves without distinct transverse reticulate veins, the seeds (1 or) 2, compressed-globose or subreniform, reddish to brown, black, or blue, the hilum short, lateral, the rim-aril usually obsolete, infrequently well developed.

TYPE SPECIES: *Rhynchosia volubilis* Lour.

DISTRIBUTION: Pantropical and subtropical, with about 200 species, one of which is an infrequent adventive in Fiji.

1. *Rhynchosia minima* (L.) DC. Prodr. 2: 385. 1825; Yuncker in Bishop Mus. Bull. 178: 65. 1943; Nootboom in Reinwardtia 5: 439. 1961; J. W. Parham, Pl. Fiji Isl. 76. 1964, ed. 2. 118. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 160. 1970; Verdcourt in Kew Bull. 25: 102. 1971, in Fl. Trop. E. Afr. Leg. Papil. 756. 1971, Man. New Guinea Leg. 553. 1979.

Dolichos minimus L. Sp. Pl. 726. 1753.

A climbing or prostrate perennial herb, adventive along roadsides, in plantations, or in waste places near sea level. The slender stems are pilose to glabrate and to several meters in length; the leaflet blades are rhomboid to ovate or suborbicular, usually 1–6 × 1–5 cm., tomentellous to glabrescent, densely gland-dotted beneath, and rounded to subacute (to acuminate) at apex. The inflorescences are axillary, lax, 3–20 cm. long, the calyx lobes longer than the tube. The suborbicular-obovate standard is 5–10 mm. long, yellow, sometimes red-veined or -flushed, the wings are yellow, and the keel is greenish. The fruits are oblong-falcate, 6–25 × 3–5 mm. (in Pacific specimens mostly 10–15 mm. long and glabrate), with (1 or) 2 seeds, these oblong-reniform, brown to blackish, and about 3 × 2 × 1.2 mm.

LECTOTYPIFICATION: Of the three elements originally designated by Linnaeus, Verdcourt (1971, both references cited above) has indicated *Sloane* 3:79 (BM LECTOTYPE), from St. Jago de la Vega, Jamaica.

DISTRIBUTION: Paleotropical, perhaps often inadvertently spread. Conceivably it was introduced into Fiji as a pasture legume, but more likely its seeds were accidentally mixed with those of some more desirable species.

AVAILABLE COLLECTIONS: VANUA LEVU: THAKAUNDROVE: Savusavu, DA L.13752. TAVEUNI: Nathongai Estate, DA 8990.

Rhynchosia minima is a complex species difficult to divide into infraspecific taxa. Eight varieties are discussed by Verdcourt (in Kew Bull. 25: 101–105. 1971). Much of the Pacific material (from Fiji, Niue, and Polynesia) could as well fall into var. *nuda* as var. *minima*. Variety *nuda* (DC.) Kuntze (Rev. Gen. Pl. 1: 204. 1891) is based on *Rhynchosia nuda* DC. (Prodr. 2: 385. 1825), typified by *Rottler* (G HOLOTYPE), from Nandaradah, India (data from Verdcourt in Fl. Trop. E. Afr., 1971, cited above).

50. ORMOCARPUM Beauv. Fl. Oware 1: 95. 1807; Seem. Fl. Vit. 55. 1865; Hutchinson, Gen. Fl. Pl. 1: 473. 1964; J. B. Gillett in Fl. Trop. E. Afr. Leg. Papil. 352. 1971; Verdcourt, Man. New Guinea Leg. 364. 1979. Nom. cons.

Shrubs or small trees, the stipules striate, persistent; leaves often fasciculate on short shoots, imparipinnate (infrequently unifoliolate) and estipellate, the leaflets more or less alternate, numerous, mucronate; inflorescences axillary, short-racemose (rarely paniculate or 1-flowered), the bracts and bracteoles striate, persistent; calyx tube campanulate, the lobes 5, usually longer than tube, the 2 upper ones proximally connate, the lowest ones slightly the longest; petals usually glabrous, often strongly veined, the standard orbicular, clawed, bituberculate above claw, the wings obliquely obovate, the keel petals broad, incurved, subequal to wings; stamens 10, the filaments connate into a sheath usually divided dorsally and ventrally, sometimes dorsally only,

or sometimes with the vexillary filament free, the anthers uniform, medifixed, a cylindrical intrastaminal disk often present; ovary substipitate, the ovules 3-9, the style filiform, inflexed, the stigma minute, terminal; fruits linear, compressed, articulate, the articles 1-9, oblong, longitudinally ribbed, indehiscent, the seeds flattened, asymmetrically ellipsoid, the hilum lateral near apex.

TYPE SPECIES: *Ormocarpum verrucosum* Beauv.

DISTRIBUTION: Paletropical: Africa to southern Asia and through Malesia to the Caroline Islands, northern Australia, and Fiji, where one species terminates the generic range, with about 20 species. The genus should have been included in my discussion of genera with distributions terminating in Fiji (in J. Arnold Arb. 36: 279. 1955); it was correctly so indicated by van Balgooy (in Blumea Suppl. 6: 178. 1971).

1. *Ormocarpum orientale* (Spreng.) Merr. Interpret. Rumph. Herb. Amb. 266. 1917; J.

B. Gillett in Kew Bull. 20: 336. 1966; Verdcourt, Man. New Guinea Leg. 364. fig. 84. 1979.

(?) *Diphaca cochinchinensis* Lour. Fl. Cochinch. 454, nom. illeg. 1790.

Parkinsonia orientalis Spreng. Syst. Veg. 4 (2): 170. 1827.

Ormocarpum sennoides sensu A. Gray, Bot. U. S. Expl. Exped. 1: 422. 1854; Seem. Viti, 435, as *Ormocarpus* s. 1862, Fl. Vit. 55. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 149. 1890; J. W. Parham, Pl. Fiji Isl. 75. 1964, ed. 2. 115. 1972; non DC.

(?) *Ormocarpum cochinchinense* Merr. in Philipp. J. Sci. Bot. 5: 76, nom. illeg. 1910, Enum. Philipp. Fl. Pl. 2: 282. 1923, in Trans. Amer. Philos. Soc. n. s. 24 (2): 198. 1935.

Shrub or small tree to 7 m. high, infrequent along dry coasts near sea level. The 9-20 leaflets are oblong to obovate, usually $2-3 \times 0.7-2$ cm.; the pedicels are up to 2.5 cm. long, with bracteoles well below base of calyx, the calyx lobes being 4-7 mm. long, longer than calyx tube; the petals are greenish yellow and purple-streaked or -veined, the standard 13-20 mm. long, with a scale at base of blade; the fruits have 1-7 articles, each $15-24 \times 5-8$ mm.

TYPIFICATION AND NOMENCLATURE: The sole basis of *Parkinsonia orientalis* is *Solulus arbor* Rumph. Herb. Amb. 3: 200. t. 128. 1743. This reference was also included by Loureiro in his protologue of *Diphaca cochinchinensis*, of which the type is *Loureiro* (BM HOLOTYPE), said to have been cultivated in Cochinchina and China. J. B. Gillett (in Kew Bull. 20: 335. 1966) concludes that *Diphaca cochinchinensis* is a doubtfully valid name, firstly because some of Loureiro's material seems to be a "monstrosity" (ICBN, Art. 71; but this Article is deleted from the 1978 "Leningrad" edition), and secondly because *Hedysarum ecastaphyllum* L. was mentioned as an apparent synonym, thus raising the possibility that Loureiro's binomial should be rejected as illegitimate (ICBN, Art. 63). The latter alternative seems a reasonable method of disposing of Loureiro's name, if indeed his concept was conspecific with the later binomial *Parkinsonia orientalis* Spreng.

DISTRIBUTION: Southern China and southeastern Asia through Malesia to the Caroline Islands, northern Australia, and Fiji. The species is infrequent (or perhaps cultivated and naturalized) in parts of this range and seems lacking from certain archipelagoes, but it appears indigenous (although infrequent) in Fiji, having been first collected there in 1840. Differences between *Ormocarpum orientale* (or *O. cochinchinense*?) and *O. sennoides* (Willd.) DC., with which it has frequently been confused, are indicated by Gillett (in Kew Bull. 20: 328, 336. 1966).

USE: In some parts of its range the leaves are said to be eaten as a vegetable, which may account for the occasional cultivation of the species.

AVAILABLE COLLECTIONS: OVALAU: Milne 236. MATUKU: Milne 108. FIJI without further locality, U. S. Expl. Exped.

51. *AESCHYNOMENE* L. Sp. 713. 1753; Rudd in *Reinwardtia* 5: 23. 1959; Hutchinson, *Gen. Fl. Pl.* 1: 474. 1964; Verdcourt in *Fl. Trop. E. Afr. Leg. Papil.* 364. 1971, *Man. New Guinea Leg.* 365. 1979.

Shrubs or herbs, often with tubercular-based hairs, the stipules peltate or basally attached; leaves alternate or clustered on short lateral branchlets, paripinnate, estipellate, the leaflets numerous (5–100), small, entire; inflorescences axillary, leaf-opposed, or terminal, racemose (or panicle or 1-flowered), the bracts often stipulelike, the bracteoles appressed to calyx; calyx lobes subequal or joined into 2 lips, the upper lip entire or bifid, the lower lip entire or trifid; petals 5, the standard suborbicular, short-clawed, the wings obliquely obovate or oblong, subequal to standard, the keel petals obovate or narrow, slightly or conspicuously incurved; stamens 10, the filaments connate into a sheath split on one or both sides, the vexillary filament very rarely free, the anthers uniform; ovary stipitate, the ovules 2–28, the style inflexed, the stigma terminal; fruits stipitate, linear or ellipsoid, compressed, articulate, the articles (1–) 2–18, smooth or tuberculate, mostly indehiscent, the seeds small, reniform, the hilum circular.

LECTOTYPE SPECIES: *Aeschynomene aspera* L. (vide Britton & Brown, *Ill. Fl. N. U. S. ed. 2.* 2: 392. 1913), one of Linnaeus's five original species.

DISTRIBUTION: Pantropical and subtropical, well developed in America, with 150 or more species. A single adventive species occurs in Fiji.

USEFUL TREATMENT OF GENUS: RUDD, V. E. The genus *Aeschynomene* in Malaysia (Leguminosae-Papilionatae). *Reinwardtia* 5: 23–36. 1959.

1. *Aeschynomene indica* L. Sp. Pl. 713. 1753; Christophersen in *Bishop Mus. Bull.* 154: 12. 1938; Greenwood in *Proc. Linn. Soc.* 154: 96. 1943; Rudd in *Reinwardtia* 5: 30. 1959; J. W. Parham in *Dept. Agr. Fiji Bull.* 35: 94. 1959, *Pl. Fiji Isl.* 70. 1964, ed. 2. 108. 1972; Verdcourt in *Fl. Trop. E. Afr. Leg. Papil.* 373. *fig. 54 (4)*. 1971, *Man. New Guinea Leg.* 367. *fig. 85*. 1979.

A frequent, shrubby, annual or perennial herb usually 0.4–2 m. high, occurring as a weed from near sea level to low elevations on gravel banks of rivers, along roadsides, in waste places, and often in wet parts of ricefields and canefields. The stipules are peltate-appendiculate, up to 15 × 3 mm., and the variable leaves (2–10 cm. long) usually have 10–30 pairs of leaflets, these elliptic-oblong, glabrous, and 2–13 × 1–3 mm. The inflorescences are 1–6-flowered, the calyx being 2-lipped and 4–6 mm. long; the standard, to 10 mm. long, is yellow to whitish and purple-streaked or -diffused, and the wings and keel petals are greenish white to pale yellow. The fruits, usually 2.5–4 cm. long and shallowly incised along the lower suture, have 5–12 articles 3–5 mm. long and broad. Flowers and fruits occur at most seasons.

TYPE SPECIES: The type is Rheede, *Hort. Ind. Malabar.* 9: 31. *t. 18.* 1689 (Verdcourt, 1971, cited above).

DISTRIBUTION: Although *Aeschynomene indica* is now pantropical and was known in the Old World as long ago as the seventeenth century, it was probably native in America (Rudd, 1959, cited above), being one member of a complex of about ten species that is otherwise confined to the New World. It has been widely introduced throughout the Old World and is frequent in ricefields. In at least one instance in Fiji (*DA L.13235*) the seeds are known to have been introduced together with American rice. The species was apparently not in Fiji until about 1920.

LOCAL NAMES: *Sensitive vetch* or *sensitive jointed vetch*.

AVAILABLE COLLECTIONS: VITI LEVU: Mba: Lautoka, *Greenwood 214*; Lomolomo, south of Lautoka, *DA 11752*; vicinity of Tonge, Mba River, *DA 10420*; near Tavua, *DA 14359*. NANDRONGA & NAVOSA: Near Lombau, Singatoka River, *DA 10165*. RA: Yanggara, *DA 4957, 10750*; Nanuku, *DA 11820*; Penang and vicinity, *Greenwood 214A, DA 5620, 11472*. NAITASIRI: Mbatiki compound, Nanduruloulou, *DA 2615*.

VANUA LEVU: MBUA: Vicinity of Mbuu, DA. May 18, 1949. TAVEUNI: Nggathavulo Plantation, DA L.13235. FIJI without further locality, DA 2971.

52. *STYLOSANTHES* Sw. Nov. Gen. & Sp. Prodr. 7, 108. 1788; Mohlenbrock in Ann. Missouri Bot. Gard. **44**: 299. 1958; Nooteboom in Reinwardtia **5**: 446. 1961; Hutchinson, Gen. Fl. Pl. **1**: 485. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 436. 1971, Man. New Guinea Leg. 371. 1979.

Perennial herbs or low shrubs, often glandular-hispid with stiff hairs, the stipules proximally adnate to petiole, biapiculate, persistent; leaves pinnately trifoliolate (rarely unifoliolate), estipellate; inflorescences axillary or terminal, densely spicate or panicle, composed of 1-flowered elements with imbricate, persistent, primary (1-3-foliolate) and secondary bracts, a plumose filiform axis (inflorescence rudiment) sometimes present, the flowers subsessile, the bracteoles 1 or 2, linear, persistent; calyx tube elongate, filiform, the lobes joined proximally, membranous, the upper ones connate into a lip, the lowermost one the longest; petals and stamens inserted at apex of calyx tube, the standard orbicular or obovate, the wings oblong or obovate, free, with a basal spur and lateral appendage, the keel petals incurved, spurred and appendaged; stamens 10, the filaments connate into a closed tube at length splitting on vexillary side, the anthers alternately long (and subbasifixed) and short (and versatile); ovary linear, sessile, the ovules 2 or 3, the style long, filiform, after anthesis the distal part caducous, the lower part persistent, recurved or revolute, callose-dilated at apex and there resembling a stigma, the true stigma terminal, minute; fruit sessile, compressed, hooked at apex by persistent style base, articulate, the articles 1 or 2 (but usually 1 article aborted), reticulate or muricate, the seeds compressed, ovoid or oblong.

LECTOTYPE SPECIES: *Stylosanthes procumbens* Sw., nom. illeg. (*Hedysarum hamatum* L.) = *S. hamata* (L.) Taubert (vide Britton & Brown, Ill. Fl. N. U. S. ed. 2: 393. 1913).

DISTRIBUTION: Pantropical and subtropical, with about 25 species. Two species have been introduced into Fijian cultivation and may be sparingly naturalized.

KEY TO SPECIES

- Fruit article 1, glabrous or minutely pilose distally, with a minute, inflexed beak (persistent style base) less than 0.8 mm. long; flowers with the calyx tube and standard each 4-8 mm. long; leaflets comparatively large, usually (in var. *guianensis*) 1.5-3 (-5) cm. × 5-10 mm.; herb or subshrub, usually erect, to 1.5 m. high. 1. *S. guianensis*
 Fruit article usually 1 (articles occasionally 2), puberulent to pilose, with an obvious, long, hooked beak (persistent style base) 5-8 mm. long and strongly protruding from fruiting inflorescence; flowers slightly smaller, the calyx tube about 5 mm. long, the standard 3-4 mm. long; leaflets comparatively narrow, usually 0.8-3.2 cm. × 2-4 mm.; much-branched perennial herb, usually prostrate. . . . 2. *S. humilis*

1. *Stylosanthes guianensis* (Aubl.) Sw. in Kongl. Vetensk. Acad. Nya Handl. **10**: 301. 1789; Mohlenbrock in Ann. Missouri Bot. Gard. **44**: 330, as *S. guyanensis*. fig. 2 (7). 1958; 't Mannetje in Austral. J. Bot. **25**: 351. fig. 1. 1977; Verdcourt, Man. New Guinea Leg. 373. 1979; Fosberg & Sachet in Smithsonian Contr. Bot. **45**: 7. 1980.

Trifolium guianense Aubl. Hist. Pl. Guiane Fr. 776. t. 309. 1775.

Stylosanthes gracilis H. B. K. Nova Gen. et Sp. 6: 507. t. 596. 1824; J. W. Parham, Pl. Fiji Isl. 77. 1964, ed. 2. 118. 1972.

Perennial herb or subshrub, usually erect, to 1.5 m. high, cultivated in introduction plots near sea level and perhaps not yet naturalized. The dense inflorescences, to 1.5 cm. long, are 2-40-flowered, lacking an axis rudiment; the calyx lobes are 3-5 mm. long, shorter than the calyx tube; the standard is orange-yellow and red-streaked, the wings are yellow, and the keel petals are greenish; and the fruit article is 2-3 × 1.5-2.5 mm., with an inflexed beak 0.1-0.8 mm. long.

TIPIFICATION AND NOMENCLATURE: The LECTOTYPE of *Trifolium guianense* is *Aublet* (BM), from Macouria, French Guiana (the specimen mounted together with *Poepig 1401*, cf. 't Mannetje, 1977, cited above, p. 351). The TYPE of *Stylosanthes gracilis* was obtained by Humboldt and Bonpland in the Cerro del Turimiquiri, Venezuela (not Ecuador as stated by 't Mannetje, p. 348). The two taxa (and others) are combined by 't Mannetje, although kept as varieties.

DISTRIBUTION: Central and South America, now widely introduced into other tropical areas and sometimes naturalized. Of the six varieties of *Stylosanthes guianensis* recognized by 't Mannetje (1977, cited above), the material grown in Fiji represents var. *guianensis*, as do most of the introductions into Australia.

LOCAL NAMES AND USES: Known in Fiji as *stylo* or *tropical lucerne*, the species was introduced in 1943 as a cover crop and as potential pasturage, but perhaps it is not yet naturalized; the available collections are all from introduction plots or quarantine stations.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Agricultural Station, Nathotholevu, near Singatoka, DA 5965. RA: Pasture Seed and Production Farm, Ndombuilevu, DA 9529. NAITASIRE: Plant Introduction and Quarantine Station, Nanduruloulou, DA, Feb. 27, 1949, 7516, FDA 13031; Principal Agricultural Station, Koronivia, DA, Dec. 2, 1949. REWA: P. Q. S., Vatuwangga, Suva, DA 11818 (L.5742).

2. *Stylosanthes humilis* H. B. K. Nova Gen. et Sp. 6: 506. t. 594. 1824; Mohlenbrock in Ann. Missouri Bot. Gard. 44: 345. fig. 2 (15). 1958; Pedley in Austrobaileya 1: 37. 1977; Verdcourt, Man. New Guinea Leg. 373. fig. 87. 1979; Fosberg & Sachet in Smithsonian Contr. Bot. 45: 7. 1980.

Stylosanthes sundaica Taubert in Verh. Bot. Vereins Prov. Brandenburg 32: 21. 1890; Nootboom in Reinwardtia 5: 450. 1961; J. W. Parham, Pl. Fiji Isl. 77. 1964, ed. 2. 118. 1972.

Much-branched perennial herb, usually prostrate but sometimes with stems ascending to 40 cm., cultivated near sea level and perhaps locally and sparingly naturalized. The compact inflorescences are usually 1–1.5 cm. long and 3–10-flowered, the axis rudiment usually absent but sometimes present; the standard is orange to yellow and sometimes pink-flushed; and the fruit article is about 3 mm. long, rigid and pilose, with a very obvious, hooked beak.

TIPIFICATION AND NOMENCLATURE: The TYPE of *Stylosanthes humilis* was collected near Carichana, along the Orinoco River near the Río Meta, Venezuela, by Humboldt and Bonpland. As COTYPES of *S. sundaica* Taubert listed Zollinger 2788, from Java, and Bauer 95, from Timor. There has been disagreement as to the reduction of *S. sundaica* to *S. humilis*, suggested by Mohlenbrock (1958) but not accepted by Nootboom (1961). I here follow the reduction as adopted by Pedley (1977) and other authors listed above.

DISTRIBUTION: Central America and northern South America, now widely introduced and naturalized elsewhere. In New Guinea and Fiji it seems to have been brought in from Queensland. Pedley (1977) suggests that it may have been introduced into Malesia by Portuguese traders in the sixteenth century.

LOCAL NAMES AND USE: Introduced into Fiji in 1932, the *Townsville stylo* or *Townsville lucerne* is considered a valuable pasture legume, but its naturalization in Fiji has been sparse and local.

AVAILABLE COLLECTIONS: VITI LEVU: RA: Yanggara, DA 2822, 2883, 3074; Colonial Sugar Refining Co. Estate, Yanggara, DA 12311; Ra without further locality, DA 13280. NAITASIRE: Plant Introduction and Quarantine Station, Nanduruloulou, DA 5827, 7515.

53. *ARACHIS* L. Sp. Pl. 741. 1753; Hutchinson, Gen. Fl. Pl. 1: 486. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 440. 1971, Man. New Guinea Leg. 380. 1979.

Low herbs, annual or perennial, often prostrate, the stipules basally adnate to petiole; leaves paripinnate (rarely trifoliolate), estipellate, the leaflets in 2 pairs; inflorescences axillary, spicate, sessile, densely 2-7-flowered, the bracts membranous, biapiculate, the flowers essentially sessile; calyx tube filiform, simulating a pedicel, the lobes membranous, the 4 upper ones connate, the lowest one slender, distinct; petals and stamens basally adnate and inserted at apex of calyx tube, the standard suborbicular, without auricles, the wings oblong, free, the keel petals incurved, beaked; stamens (8-) 10, the filaments all connate into a closed tube, the anthers alternately elongate (and subbasifixed) and short (and versatile); ovary subsessile, linear, with (1-) 2-4 (-7) ovules, the gynophore elongating after anthesis, becoming reflexed and rigidly acute at apex, the style filiform, long, deciduous, the stigma terminal, minute; fruits maturing underground, oblong, thick-walled and reticulate, functionally indehiscent, subtorulose but not articulate, continuous within, the seeds 1-3 (-6), irregularly ovoid, the cotyledons thick, fleshy.

TYPE SPECIES: *Arachis hypogaea* L., the only original species.

DISTRIBUTION: Eastern South America, with about 22 species, one of which is widely cultivated.

1. *Arachis hypogaea* L. Sp. Pl. 741. 1753; Yuncker in Bishop Mus. Bull. 178: 62. 1943; Surridge in Agr. J. Dept. Agr. Fiji 18: 9. 1947; J. W. Parham, Pl. Fiji Isl. 71. 1964, ed. 2. 109. 1972; Pursglove, Trop. Crops, Dicot. 225. fig. 34. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 144. 1970; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 442. fig. 63. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 101. 1972; Smartt, Trop. Pulses, 51. fig. 2.4. 1976; Verdcourt, Man. New Guinea Leg. 381. fig. 89. 1979.

Annual herb, branched from base, with erect or straggling stems, sparingly cultivated near sea level. The 4-foliolate leaves have the leaflets obovate to elliptic and up to 7 × 3 cm.; the inflorescences are few-flowered, with the calyx tube at anthesis up to 6 cm. long and stalklike; the petals are yellow and red- or purple-nerved, the standard being 9-13 mm. in diameter; the fertile stamens are 8 or 9; and the pods are 2-6 cm. long, the gynophore becoming 1-20 cm. long.

TYPIFICATION: Of the several references given by Linnaeus, that to *Hortus Upsaliensis* is taken to indicate the LECTOTYPE: no. 909.1 (LINN), grown at Uppsala from seeds from "Brazil and Peru" (Verdcourt, 1971, cited above).

DISTRIBUTION: *Arachis hypogaea* is a cultigen not known in a wild state, doubtless originating in eastern Brazil or adjacent areas and now widely cultivated on a commercial scale in tropical, subtropical, and warm temperate regions. It is known to have been widely distributed in much of South America by 800 B. C. In the sixteenth century voyagers spread the plant widely and it has become an important crop, many cultivars having been developed.

LOCAL NAMES AND USES: The *peanut* or *groundnut* was perhaps first introduced into Fiji by J. B. Thurston, being listed in his 1886 *Catalogue*, but it is cultivated on only a small scale. The seeds are edible as the familiar peanut and are utilized in the preparation of many foods as well as a source of high quality oil, being second only to the soybean in world importance as a vegetable oil.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Agricultural Station, Nathotholevu, near Singatoka, DA 12316 (FDA 15342). RA: Savusavu, Wainimbuka River, DA 5705.

54. *Vicia* L. Sp. Pl. 734. 1753; Hutchinson, Gen. Fl. Pl. 1: 452. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 1067. 1971, Man. New Guinea Leg. 554. 1979.

Annual or perennial herbs, climbing and tendrillous or suberect, the stems unwinged, the stipules semisagittate, often dentate or divided; leaves usually paripinnate, estipellate, the rachis sometimes terminating in a tendril or bristle, the leaflets usually numerous (rarely 1-3 pairs); inflorescences axillary, racemose, (1-) few-flowered, the bracts minute, caducous, the bracteoles none; calyx tube often oblique and asymmetrical, the lobes subequal or the 2 upper ones shorter and partly joined; standard narrowed into a broad claw, the wings obliquely oblong, usually adherent to keel, the keel petals shorter than wings; stamens 10, the filaments connate into a tube oblique at mouth, the vexillary filament free or lightly adhering to sheath, the anthers uniform, versatile; ovary subsessile or stipitate, the ovules (2-) numerous, the style terete or compressed dorsally or laterally, pilose all around or ventrally or abaxially tufted at apex, the stigma terminal; fruits oblong to linear, compressed, dehiscent, not septate, the seeds globose or compressed, with a thin aril.

LECTOTYPE SPECIES: *Vicia sativa* L. (vide Britton & Brown, Ill. Fl. N. U. S. ed. 2: 2: 408. 1913), one of the 17 species originally included by Linnaeus.

DISTRIBUTION: Temperate parts of Northern Hemisphere, extending into South America and eastern Africa, with about 140 species; one species is cultivated in Fiji.

1. *Vicia faba* L. Sp. Pl. 737. 1753; Yuncker in Bishop Mus. Bull. 178: 66. 1943; J. W. Parham, Pl. Fiji Isl. 77. 1964, ed. 2. 119. 1972; Purseglove, Trop. Crops, Dicot. 319. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 161. 1970; Smartt, Trop. Pulses, 38, 49. 1976; Rudd in Rev. Handb. Fl. Ceylon 1: 458. 1980.

Erect annual herb to 1.5 m. high, occasionally cultivated, with tetragonous stems. The 2-6 leaflets are elliptic to ovate and 5-10 × 1-5 cm.; the inflorescences are erect, 2-6-flowered, with the standard 2-4 cm. long and white, sometimes dorsally black-streaked; and the linear fruits are 10-30 × 2-4 cm., the pericarp with a spongy white layer within, the seeds 1-6, variously colored, 1-2.5 cm. long.

TYPIFICATION: Several prior references were listed by Linnaeus, among which I have not noted an indicated lectotype.

DISTRIBUTION: *Vicia faba* is one of the oldest of cultivated plants, not known in the wild but presumably of Mediterranean or southwestern Asian origin. It was widely grown in prehistoric times but was not known in the New World until the post-Columbian period.

LOCAL NAMES AND USES: The most frequent name, *broad bean*, is used in Fiji; other widely used names are *fava bean*, *horse bean*, and *Windsor bean*. There are many cultivars, used for the edible green shell beans or the dried beans. The entire plant is used for fodder. The species is a cool weather crop, of which the seeds must be imported annually into Fiji. No herbarium vouchers are available.

55. *Lathyrus* L. Sp. Pl. 729. 1753; Hutchinson, Gen. Fl. Pl. 1: 453. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 1076. 1971, Man. New Guinea Leg. 558. 1979.

Annual or perennial herbs, sometimes tendrillous, the stem often winged, the stipules foliaceous, sagittate or semisagittate, persistent; leaves paripinnate, often unijugate, the petiole sometimes dilated and leaflike, the rachis terminating in a tendril or bristle, the leaflets 1-few (-numerous) pairs, the blades with supervolute vernation, rarely absent; inflorescences axillary, racemose or 1-flowered, the bracts minute, caducous, the bracteoles none; calyx tube often oblique or gibbous, the lobes subequal or the upper pair the shortest; standard with a short, broad claw, the wings falcate to obovate, slightly adherent to keel or not, the keel petals incurved, shorter than wings;

stamens 10, the filaments connate into a sheath usually truncate at apex, the vexillary filament free or somewhat connate to sheath, the anthers uniform; ovary subsessile or stipitate, the ovules few-numerous, the style inflexed, dorsally compressed and often distally indurated, pubescent only on adaxial face, the stigma terminal, capitate; fruits linear-oblong, dehiscent, continuous within, the seeds globose or angular, sometimes compressed, with a thin aril.

LECTOTYPE SPECIES: *Lathyrus sylvestris* L. (vide Britton & Brown, Ill. Fl. N. U. S. ed. 2: 412. 1913), one of Linnaeus's original 21 species.

DISTRIBUTION: Northern Hemisphere, extending into South America and Africa, with about 150 species; one ornamental is cultivated in Fiji.

1. *Lathyrus odoratus* L. Sp. Pl. 732. 1753; J. W. Parham, Pl. Fiji Isl. 74. 1964, ed. 2. 114. 1972; Rudd in Rev. Handb. Fl. Ceylon 1: 457. 1980.

An annual climbing herb, often cultivated in gardens. The leaves are unijugate, with elliptic to obovate, thin-pilose leaflets usually 2-4 cm. long; the flowers are borne in 2-5-flowered racemes, the showy petals being lilac to pink or white or variegated, the standard usually 2-4 cm. in diameter; and the fruits are 5 cm. long or more, with subglobose, gray to brown seeds.

TYPIFICATION: Linnaeus knew the species well as a garden ornamental, but I have not noted a lectotype designation.

DISTRIBUTION: Indigenous in Europe but now very widely cultivated.

LOCAL NAME AND USE: *Sweet pea*; an attractive, well-known garden plant with very fragrant flowers. No herbarium vouchers are available.

56. *LENS* Mill. Gard. Dict. Abridg. ed. 4. 1754; Hutchinson, Gen. Fl. Pl. 1: 453. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 1074. 1971. Nom. cons.

Slender, erect or subsucculent, annual herbs, the stipules linear or ovate to semisagittate; leaves usually paripinnate, estipellate, the rachis terminating in a tendril or bristle (or in a leaflet in imparipinnate leaves), the leaflets 2-several pairs, the blades with conduplicate venation; inflorescences axillary, racemose and few-flowered or 1-flowered, the bracts small, deciduous, the bracteoles none; calyx 5-lobed, the lobes elongated, subulate, subequal; petals small, the standard obovate, narrowed into a short, broad claw, the wings obliquely obovate, adherent to middle of keel, the keel petals shorter than wings; stamens 10, the filaments connate into a sheath with an oblique mouth, the vexillary filament free, the anthers uniform; ovary subsessile, the ovules 2, the style inflexed, dorsally compressed, pubescent only on adaxial face; fruits compressed, dehiscent, continuous within, the valves papery, the seeds 1 or 2, compressed, lenticular, with a thin aril.

TYPE SPECIES: *Lens culinaris* Medik. (*Ervum lens* L.).

DISTRIBUTION: Western Asia and Mediterranean region, perhaps with one species in Africa, with six species, one of which is an important food plant.

1. *Lens culinaris* Medik. in Vorles. Churpfälz. Phys.-Öcon. Ges. 2: 361, as *L. culinare*. 1787; Rudd in Rev. Handb. Fl. Ceylon 1: 458. 1980.

Ervum lens L. Sp. Pl. 738. 1753.

Lens esculenta Moench, Meth. Pl. 131. 1794; J. W. Parham, Pl. Fiji Isl. 74. 1964, ed. 2. 114. 1972; Purseglove, Trop. Crops, Dicot. 279. 1968; Smartt, Trop. Pulses, 39, 47. fig. 2.18 (2). 1976.

Sparsely cultivated, erect or subsucculent annual herb to 40 cm. high, with an angular stem and ovate-lanceolate stipules. The leaflets are 4-7 pairs, oblong to lanceolate, usually 10-15 mm. long, and finely pubescent; the 1-4-flowered inflorescences bear flowers to 8 mm. long, the petals being shorter than the calyx, white to pink or pale blue, the standard violet-streaked; and the fruits are oblong, 12-15 × 8-10 mm., with greenish to brown, red- or black-speckled seeds.

TYPIFICATION: Among the several references given by Linnaeus for *Ervum lens*, upon which both listed names in *Lens* are based, no lectotypification has been noted by me.

DISTRIBUTION: A plant of ancient cultivation in the Mediterranean area and western Asia, not known in the wild, now widely cultivated and with various cultivars. It is not suited to the wet tropics but is occasionally grown in dry parts of Fiji, although not represented by herbarium vouchers.

LOCAL NAME AND USES: The *lentil* has highly nutritious seeds that are used in soups, flour, cereal, etc. The young pods may also be used as a vegetable, and the husks provide fodder for livestock. The species has doubtless been introduced into Fiji during the present century.

57. *PISUM* L. Sp. Pl. 727. 1753; Hutchinson, Gen. Fl. Pl. 1:454. 1964; Verdcourt, Man. New Guinea Leg. 560. 1979.

Erect or climbing, annual or perennial herbs, the stipules small to foliaceous, semicordate or semisagittate; leaves paripinnate, estipellate, the rachis terminating in a branched tendril or a bristle, the leaflets 1-3 (-4) pairs, the blades with conduplicate venation; inflorescences axillary, racemose, the peduncle elongated, the flowers (1-) few, the bracts minute, caducous, the bracteoles none; calyx tube asymmetrical, oblique or gibbous at base, the lobes subequal or the 2 upper ones the broadest; standard obovate-orbicular, with a short, broad claw, the wings falcate-oblong, adherent in middle to keel, the keel petals shorter than wings, incurved; stamens 10, the filaments slightly dilated distally and connate into a sheath with a truncate mouth, the vexillary filament free or connate to sheath in middle, the anthers uniform; ovary subsessile, the ovules numerous, the style inflexed, dorsally compressed, adaxially pubescent, longitudinally folded with the margins joined abaxially below stigma, the stigma subterminal; fruits inflated, obliquely acute, dehiscent, the seeds subglobose, with a thin aril covering the oblong hilum.

LECTOTYPE SPECIES: *Pisum sativum* L. (vide M. L. Green, Prop. Brit. Bot. 175. 1929), one of Linnaeus's four original species.

DISTRIBUTION: Mediterranean area and western Asia, with two or three species, one of which is an important food plant.

1. *Pisum sativum* L. Sp. Pl. 727. 1753; Yuncker in Bishop Mus. Bull. 178: 66. 1943; J. W. Parham, Pl. Fiji Isl. 76. 1964, ed. 2. 116. 1972; Purseglove, Trop. Crops, Dicot. 311. fig. 48. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 159. 1970; Smartt, Trop. Pulses, 38, 47. fig. 2.3, 2.18 (3). 1976; Verdcourt, Man. New Guinea Leg. 562. 1979; Rudd in Rev. Handb. Fl. Ceylon 1: 458. 1980.

A glabrous annual herb to 2 m. high or long, cultivated or occasionally seen as an ephemeral escape from sea level upward, with tetragonous stems, the stipules conspicuous, clasping the stem, up to 10 × 5 cm. The leaflets are ovate-oblong, up to 7 × 4 cm. and usually smaller than stipules; the petals (in var. *sativum*) are white, the standard usually 1.2-2 cm. long; and the fruits are usually 5-10 × 1.5-3 cm., with 2-10 seeds, these usually green.

TYPIFICATION: Linnaeus cited several references, among which I have not noted selection of a lectotype.

DISTRIBUTION: Although not known in a wild state, the pea may have been first cultivated in southwestern Asia in neolithic times, rapidly spreading throughout the Old World and later to the New World. A great number of cultivars have been developed. The edible garden pea is referred to var. *sativum*.

LOCAL NAMES AND USE: *Pea, garden pea, green pea, mattar* (Hindi); the familiar green pea is often cultivated in Fiji as a vegetable, although seeds must be imported annually. The pods of some cultivars are also edible.

AVAILABLE COLLECTION: VITI LEVU: REWA: Suva, DA 16990.

58. *CICER* L. Sp. Pl. 738. 1753; Hutchinson, Gen. Fl. Pl. 1: 452. 1964; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 1065. 1971.

Perennial or annual herbs, glandular-viscid, the stipules foliaceous, oblique, dentate or incised; leaves often imparipinnate (rarely trifoliolate), estipellate, the rachis terminating in a small tendril or spine or leaflet, the leaflet blades conspicuously dentate; inflorescences axillary, racemose with 2-5 flowers or 1-flowered, the bracts small, the bracteoles none; calyx tube oblique or gibbous, the lobes subequal or the 2 upper ones slightly the shortest and connivent; standard narrowed into a broad claw, without appendages, the wings obliquely obovate, free, the keel petals broad, incurved; stamens 10, the filaments dilated distally, 9 connate into a sheath, the vexillary filament free, the anthers uniform, versatile or sometimes alternately basifixed; ovary sessile, the ovules 2-few, the style filiform, incurved, glabrous distally, the stigma terminal; fruits sessile, oblong to ellipsoid, inflated, glandular-pilose, dehiscent, the seeds 1-10, subglobose or irregularly obovoid.

TYPE SPECIES: *Cicer arietinum* L., the only original species.

DISTRIBUTION: Europe to central Asia and locally in northern Africa, with about 40 species, one of which is widely cultivated.

1. *Cicer arietinum* L. Sp. Pl. 738. 1753; J. W. Parham, Pl. Fiji Isl. 72. 1964, ed. 2. 110. 1972; Purselove, Trop. Crops, Dicot. 246. fig. 37. 1968; Verdcourt in Fl. Trop. E. Afr. Leg. Papil. 1065. fig. 152. 1971; Smartt, Trop. Pulses, 37, 44. fig. 2.1, 2.18 (1). 1976; Rudd in Rev. Handb. Fl. Ceylon 1: 457. 1980.

Erect or spreading annual herb to 50 cm. high, cultivated on a small scale in dry areas, the tetragonous stems, leaves, calyx, and fruit glandular-pubescent. The imparipinnate leaves have about 9-14 leaflets with elliptic blades usually 7-20 × 4-15 mm.; the flowers are solitary, borne on pedicels 5-10 mm. long and slightly longer than peduncles, the petals being white to purplish red, the standard 10-15 mm. long; and the fruits are 1.5-3 × 1-2 cm., with 1 or 2 angular, oblong-obovoid, white to red or black seeds 5-10 mm. in diameter.

TYPIFICATION: Of the several references listed by Linnaeus, that to *Hortus Cliffortianus* may be taken to provide the LECTOTYPE: Hort. Cliff. (BM) (Verdcourt, 1971, cited above).

DISTRIBUTION: Not known in a wild state but found in prehistoric sites in the eastern Mediterranean area and western Asia, early spreading in the Old World and now widely cultivated. Various cultivars are known.

LOCAL NAMES AND USES: *Chick pea; gram; chana* (Hindi); an important pulse, especially in India. The dried seeds are edible when cooked or made into flour, and the green pods and young shoots are used as a vegetable. The species was introduced into Fiji about 1935.

AVAILABLE COLLECTION: VITI LEVU: NATASIRE: Nanduruloulou, DA 11542.

59. *TRIGONELLA* L. Sp. Pl. 776. 1753; Hutchinson, Gen. Fl. Pl. 1: 456. 1964; Huber-Mor. in Davis, Fl. Turkey 3: 452. 1970.

Herbs, the stipules adnate to petiole; leaves pinnately trifoliolate, the leaflet blades with nerves extending to the dentate margin; inflorescences subumbellate or densely

short-racemose or 1-flowered, the bracts minute, the bracteoles none, the flowers without an explosive tripping mechanism; calyx campanulate, with subequal lobes; petals not persisting in fruit, the standard obovate to oblong, contracted into a broad claw, the wings oblong, the keel petals shorter than wings, obtuse; stamens 10, the filaments not dilated, 9 connate into a sheath, the vexillary filament free or connate to sheath in middle, the anthers uniform; ovary sessile or short-stipitate, the ovules numerous, the style filiform or thickened, glabrous, the stigma terminal; fruits nearly straight, rarely falcate, beaked, not included in calyx, terete or compressed, dehiscent or opening along seed-bearing suture, continuous within, the seeds many.

LECTOTYPE SPECIES: *Trigonella foenum-graecum* L. (vide M. L. Green, Prop. Brit. Bot. 177. 1929), one of Linnaeus's seven original species.

DISTRIBUTION: Canary Islands and Mediterranean area to central Asia, and in desert regions of southern Africa and Australia, with about 80 species, one of which has been introduced into Fiji.

1. *Trigonella foenum-graecum* L. Sp. Pl. 777. 1753; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 13: 51. 1942; J. W. Parham, Pl. Fiji Isl. 77. 1964, ed. 2. 119. 1972; Huber-Mor. in Davis, Fl. Turkey 3: 481. 1970; Rudd in Rev. Handb. Fl. Ceylon 1: 456. 1980.

A fragrant herb to 50 cm. high, branched from base, sparsely cultivated near sea level and sometimes noted as an escape; the leaflet blades are obovate to oblanceolate, 10-30 × 5-15 mm.; the flowers are 1 or 2 in leaf axils and have petals 12-18 mm. long, yellowish white and sometimes lilac-tinged; and the fruits are about 10 cm. × 5 mm., longitudinally reticulate-veined and with 10-20 seeds.

TYPIIFICATION: Several references were given by Linnaeus; Huber-Morath (1970, cited above) indicates the species to have been "described from France (Montpellier)": no. 932/16 (LINN LECTOTYPE).

DISTRIBUTION: Mediterranean area into Asia, established as a medicinal plant in ancient Egypt and now widely cultivated.

LOCAL NAMES AND USES: *Fenugreek*; *methi* (Hindi). The seeds are used as a condiment, and the young leaves and pods are cooked as a vegetable. In other areas the seeds are used medicinally and for cosmetic purposes. The species was probably introduced into Fiji about 50 years ago, but no herbarium vouchers are available. A more recent introduction, made in 1966, is numbered *FDA* (introduction number) 16235.

60. *MEDICAGO* L. Sp. Pl. 778. 1753; Hutchinson, Gen. Fl. Pl. 1: 457. 1964; J. B. Gillett in Fl. Trop. E. Afr. Leg. Papil. 1036. 1971; Verdcourt, Man. New Guinea Leg. 565. 1979.

Herbs, the stipules adnate to base of petiole, dentate or laciniate; leaves pinnately trifoliolate, estipellate, the leaflet blades with veins extending to the dentate margins; inflorescences axillary, short-racemose, the peduncle, pedicels, and bracts short, the bracteoles none, the flowers with an explosive tripping mechanism; calyx tube short, the lobes subequal; petals small, free from filament tube, not persisting in fruit, the standard obovate to oblong, contracted at base, the wings oblong, the keel petals obtuse, shorter than wings; stamens 10, the filaments not dilated, 9 connate into a tube, the vexillary filament free, the anthers uniform; ovary sessile, the ovules (1-) numerous, the style subulate, glabrous, the stigma terminal; fruits curved or coiled, reticulate-veined, not included in calyx, usually indehiscent, sometimes spiny, the seeds 1-several, curved.

LECTOTYPE SPECIES: *Medicago radiata* L. (vide Scofield in U. S. Dept. Agr. Bur. Pl. Indust. Bull. 131: 15. 1908), one of Linnaeus's nine original species.

DISTRIBUTION: Europe and Africa to western Asia, most numerous in the Mediterranean region, with about 50 species, one of which has been introduced into Fiji.

1. *Medicago sativa* L. Sp. Pl. 778. 1753; J. W. Parham, Pl. Fiji Isl. ed. 2. 114. 1972; Verdcourt, Man. New Guinea Leg. 565. fig. 143. 1979; Rudd in Rev. Handb. Fl. Ceylon 1: 456. 1980.

Perennial herb to about 50 cm. high, cultivated near sea level as a potential pasture legume but perhaps not established. The leaflets are obovate or oblong, usually 10–25 × 4–12 mm.; the petals are blue to purple, usually 5–10 mm. long, the wings and keel petals long-clawed; and the fruits are unarmed, variable, falcate to coiled into 1–3 turns.

TYPIFICATION: Of the references listed by Linnaeus, perhaps that to *Hortus Cliffortianus* would suggest the best LECTOTYPE: Herb. Cliff. (BM).

DISTRIBUTION: Southern Europe, now widely cultivated and often naturalized. Our material falls into subsp. *sativa*.

LOCAL NAMES AND USES: *Alfalfa*, *lucerne*. One of the most valuable fodder plants, but usually not becoming established in the lowland tropics and probably not suitable for use as a pasture legume in Fiji, where it has been tried in experimental plots during recent years. The available collections were obtained in 1961.

AVAILABLE COLLECTIONS: VITI LEVU: RA: Colonial Sugar Refining Co. Estate, Yanggara, DA 12306, 12307.

61. *TRIFOLIUM* L. Sp. Pl. 764. 1753; Hutchinson, Gen. Fl. Pl. 1: 457. 1964; J. B. Gillett in Fl. Trop. E. Afr. Leg. Papil. 1016. 1971; Verdcourt, Man. New Guinea Leg. 562. 1979; Rudd in Rev. Handb. Fl. Ceylon 1: 452. 1980.

Annual or perennial herbs, the stipules well developed, proximally adnate to petiole; leaves digitately (rarely pinnately) 3(–7)-foliolate, estipellate, the leaflet blades mostly denticulate, with veins extended to margins; inflorescences axillary or rarely subterminal, often long-pedunculate, racemose but condensed and appearing spicate, capitate, or umbellate, rarely 1-flowered, the bracts small or absent or sometimes the outer ones connate into an involucre, the bracteoles none; calyx campanulate, often conspicuously nerved, the teeth subequal or the lower ones the longer; petals marcescent, often persisting in fruit, clawed, the claws of 4 usually adnate to filament sheath, the standard oblong to ovate, the wings narrow, the keel petals obtuse, shorter than wings; stamens 10, the alternate or all filaments apically dilated, 9 connate into a sheath, the vexillary filament free or rarely connate to sheath in middle, the anthers uniform; ovary sessile or short-stipitate, the ovules 1–12, the style filiform, distally incurved, the stigma small, capitate or punctate; fruits oblong or obovate, subterete or compressed, included in or exserted from persistent calyx, indehiscent or dehiscent distally or irregularly, the seeds 1 or 2 (–4), subglobose to reniform.

LECTOTYPE SPECIES: *Trifolium pratense* L. (vide Britton & Brown, Ill. Fl. N. U. S. ed. 2. 2: 353. 1913), one of Linnaeus's original 40 species.

DISTRIBUTION: Subtropical and temperate, with centers of diversity in the eastern Mediterranean area, western Asia, and western America, with 250–300 species, including many important fodder plants that have become widely naturalized.

Species of *Trifolium* are probably not significant as fodder plants in Fiji, although it is likely that representatives will be occasionally found in pastures. As a rule clovers do not flourish in tropical lowlands, but at least the following species have been tried

experimentally in Fiji by the Department of Agriculture, from seed with the indicated "FDA" numbers:

- T. alexandrinum* L. (FDA 15706)
- T. hirtum* All. (FDA 15415)
- T. resupinatum* L. (FDA 15705, 15707)
- T. rueppellianum* Fresen. (FDA 15212, 15414)
- T. stipilosum* Fresen. (FDA 15213, 15413, 19019)

Some of these species may have become ephemerally established in Viti Levu pastures, but none are represented by herbarium vouchers. An available herbarium voucher is DA 9559 (Plant Introduction and Quarantine Station, Nanduruloulou, Naitasiri), with purple flowers and very narrow, lanceolate leaflets, representing an unidentified species. The only species likely to become firmly established is the following.

1. **Trifolium repens** L. Sp. Pl. 767. 1753; Backer & Bakh. f. Fl. Java 1: 588. 1963; Verdcourt, Man. New Guinea Leg. 563. fig. 142B. 1979; Rudd in Rev. Handb. Fl. Ceylon 1: 453. 1980.

Essentially glabrous, perennial herb, with long stems rooting at nodes, cultivated near sea level and perhaps occasionally naturalized in pastures. The long-petiolate leaves have leaflet blades obovate to elliptic, 1-2 cm. long and broad, and emarginate or obtuse; the inflorescences are usually subglobose and 1.5-2 cm. in diameter, many-flowered, with peduncles 10-30 cm. long and short-pedicellate, fragrant flowers, the petals being 8-12 mm. long and usually pure white; and the fruits are linear, 4-5 mm. long, compressed, and constricted between the 3 or 4 seeds.

TIPIFICATION: Of the references given by Linnaeus, that to *Hortus Cliffortianus* may be taken to indicate the LECTOTYPE: Herb. Cliff. 375.18 (BM) (Rudd, 1980, cited above).

DISTRIBUTION: Europe and Asia, now widely cultivated as a fodder plant, with various cultivars. If varieties are recognized, that introduced into Fiji seems to be var. *repens*.

LOCAL NAME AND USE: *White clover*; a well-known and important fodder plant, said to have been introduced into Fiji in 1946.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Principal Agricultural Station, Koronivia, DA, Dec. 2, 1949.

62. **CROTALARIA** L. Sp. Pl. 714. 1753; Seem. Fl. Vit. 54. 1865; Munk in Reinwardtia 6: 196. 1962; Hutchinson, Gen. Fl. Pl. 1: 365. 1964; Polhill in Fl. Trop. E. Afr. Leg. Pabil. 817. 1971; Verdcourt, Man. New Guinea Leg. 570. 1979.

Shrubs or herbs, the stipules filiform to foliaceous, sometimes lacking; leaves simple, unifoliolate, or digitately 3-7-foliolate, estipellate; inflorescences terminal or leaf-opposed (less commonly axillary), racemose (or subcapitate or subumbelliform), rarely 1-flowered or fasciculate, the bracts small, rarely foliaceous, sometimes caducous before anthesis, the bracteoles small or rarely absent; calyx tube protracted on lower side or 2-lipped, the lobes free or the upper and lateral lobes united; petals usually longer than calyx, the standard orbicular to elliptic, often callose-appendaged at base within, glabrous or pubescent without, the wings obovate or oblong, shorter than standard, the keel petals incurved, usually prominently beaked, the beak sometimes twisted; stamens 10, the filaments all connate into a sheath split at least at base on vexillary side, the anthers dimorphic, alternately short (and versatile) and long (and basifixed); ovary usually stipitate, the ovules 2-many, the style incurved or inflexed, usually bearded distally, the stigma terminal, small; fruits sessile to long-stipitate, subcylindric to oblong-clavate, inflated (usually markedly so), dehiscent (sometimes tardily so), continuous within, the seeds 1-many, sometimes conspicuously arillate.

LECTOTYPE SPECIES: *Crotalaria lotifolia* L. ("lotifolia") (vide Britton & Brown, Ill. Fl. N. U. S. ed. 2: 346. 1913), one of Linnaeus's 13 original species.

DISTRIBUTION: Pantropical and subtropical, best developed in the Southern Hemisphere, most numerous in tropical Africa, with about 600 species. Seven species are known to occur in Fiji. None are strictly indigenous, but three are apparently adventive rather than intentionally introduced, the remaining species being cultivated in introduction gardens and sometimes naturalized.

USEFUL TREATMENTS OF GENUS: MUNK, W. J. DE. Preliminary revisions of some genera of Malaysian Papilionaceae III—A census of the genus *Crotalaria*. *Reinwardtia* 6: 195-223. 1962. POLHILL, R. M. Miscellaneous notes on African species of *Crotalaria* L.: II. *Kew Bull.* 22: 169-348. 1968.

KEY TO SPECIES

Leaves simple.

Leaf blades oblanceolate to oblong-obovate, usually 4-8 × 1.5-2.5 cm.; racemes terminal, to 30 cm. long, many-flowered; fruits 4-5 × 1.3-1.8 cm., glabrous, the seeds 12-20, 4-5 mm. long; adventive, presumably not intentionally introduced. 1. *C. retusa*

Leaf blades lanceolate-oblong, 6-13 × 0.5-2 cm.; racemes lax, 10-25 cm. long, usually 5-15-flowered; fruits about 3 × 1 cm., copiously short-brown-tomentose, the seeds 6-10, 5-6 mm. long; cultivated only (or perhaps becoming naturalized). 2. *C. juncea*

Leaves with 3 or more leaflets.

Leaflets 3.

Fruits copiously spreading-pilose, 3-4.5 cm. × 8-17 mm., the seeds 40-50; stipules filiform, usually 3-12 mm. long; our subspecies with long, ferruginous hairs on stems, petioles, lower leaflet blade surfaces, bracts, and calyx; leaflet blades elliptic-obovate to suborbicular, 2.5-5 × 1.5-4 cm.; petals 8-11 mm. long; cultivated only (or possibly becoming naturalized). 3. *C. incana*

Fruits appressed-pilose or puberulent and soon glabrate; stipules 2-4 mm. long; stems, petioles, lower leaflet blade surfaces, bracts, and calyx with short, appressed hairs, often glabrate; petals usually 13-15 mm. long.

Leaflet blades in our variety obovate, usually 3-7 × 1.5-4 cm., retuse to rounded at apex; fruits narrowly cylindrical, usually 3.5-4.5 cm. × 5-8 mm., the seeds 30-40; adventive, presumably not intentionally introduced. 4. *C. pallida*

Leaflet blades narrowly elliptic or oblong-lanceolate, (3-) 5-10 × 1-3 cm., acute at apex; fruits oblong, usually 3-4 × 1-1.5 cm., the seeds 8-18; cultivated only (or possibly becoming naturalized). 5. *C. anagyroides*

Leaflets 5-7.

Stems angular, short-pale-pilose; stipules 3-4 mm. long; leaflets 5, the blades lanceolate to linear, 3-9 cm. × 4-10 mm., obtuse to subacute at apex, pale-strigose beneath; flowers 1.5-2 cm. long; fruits about 6 × 1.5-2 cm.; adventive, presumably not intentionally introduced. 6. *C. quinquefolia*

Stems copiously ferruginous-tomentellous, becoming terete; stipules 7-10 mm. long; leaflets 5-7, the blades obovate, 3-7 × 1-2 cm., retuse to rounded at apex, copiously ferruginous-pilose beneath; flowers to 2.5 cm. long; fruits 3-5 × about 1.5 cm.; cultivated only (or possibly becoming naturalized). 7. *C. grahamiana*

1. *Crotalaria retusa* L. Sp. Pl. 715. 1753; Greenwood in Proc. Linn. Soc. 154: 96. 1943; Yuncker in Bishop Mus. Bull. 220: 138. 1959; Munk in Reinwardtia 6: 212. 1962; Backer & Bakh. f. Fl. Java 1: 580. 1963; J. W. Parham, Pl. Fiji Isl. 72. 1964, ed. 2. 110. 1972; Polhill in Kew Bull. 22: 310. 1968, in Fl. Trop. E. Afr. Leg. Papil. 958. 1971; Verdcourt, Man. New Guinea Leg. 583. fig. 145, 147 (G). 1979; Henty in Papua New Guinea Dept. Forests Bull. 12: 83. fig. 50. 1980.

Erect annual or short-lived perennial herb or shrub 0.5-1 m. high, adventive in grassland and along roadsides near sea level. The ribbed stems are pilose with short, appressed, pale hairs, and the subulate stipules are 1-5 mm. long; the leaf blades are rounded or emarginate at apex and shortly appressed-pilose beneath; the flowers, 2-2.5 cm. long, have bright yellow petals, the standard being purple-lined or -blotched, the keel with a short, twisted beak; and the fruits are oblong-clavate, with yellowish or brown seeds. Flowers and fruits have been obtained between March and August.

TYPIFICATION: The type material was obtained in Ceylon by Hermann: folio 2: 21,

84, & 4: 51, 78 (BM SYNTYPES) (Polhill, 1971, cited above).

DISTRIBUTION: Although the original distribution is obscured by widespread introduction and naturalization, the species may have been indigenous in Asia or coastal eastern Africa (Polhill, 1968, 1971). The Fijian material falls into var. *retusa*.

USE: The species was presumably not intentionally introduced, as it is poisonous to stock and especially dangerous to horses. No Fijian collections are older than about 50 years.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Lautoka and vicinity, *Greenwood 27, 27Z*. REWA: Muainira, Vutia Creek, Rewa delta, *DA 13678*. OVALAU: Wainiloka, *DA 5682*. TAVEUNI: Vicinity of Waivevo, *Smith 8107*.

2. ***Crotalaria juncea*** L. Sp. Pl. 714. 1753; Munk in Reinwardtia **6**: 206. 1962; Backer & Bakh. f. Fl. Java **1**: 582. 1963; Pursglove, Trop. Crops, Dicot. 250. fig. 38. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 148. 1970; Polhill in Fl. Trop. E. Afr. Leg. Papil. 950. 1971; Verdcourt, Man. New Guinea Leg. 579. fig. 147 (E). 1979; Henty in Papua New Guinea Dept. Forests Bull. **12**: 85. 1980.

Laxly branched, erect, annual herb to 3 m. high, cultivated only near sea level, or perhaps becoming naturalized. The stems are ribbed and appressed-pilose, and the filiform stipules are about 2 mm. long; the calyx, 16–20 mm. long, is copiously brown-pilose; and the petals are yellow, faintly marked with red, the standard to 25 mm. long, the keel to 20 mm. long and with the beak twisted.

TYPIFICATION: Of the references cited by Linnaeus, that to *Hortus Cliffortianus* may be taken to provide the LECTOTYPE: a specimen from India, the collector uncertain, Herb. Cliff. (BM) (Polhill, 1971).

DISTRIBUTION: Indigenous in India, but now cultivated throughout the tropics.

LOCAL NAMES AND USES: *Sunn hemp*; *san* (Hindi); a useful species as a cover crop or a green manure, and in India an important source of bast fiber, but said to be poisonous to stock.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Plant Introduction and Quarantine Station, Nanduruloulou, *DA*, Jan. 23, 1952 (*FDA 13401*).

3. ***Crotalaria incana*** L. Sp. Pl. 716. 1753; Munk in Reinwardtia **6**: 205. 1962; Polhill in Fl. Trop. E. Afr. Leg. Papil. 869. 1971; Verdcourt, Man. New Guinea Leg. 579. fig. 147 (D). 1979.

Annual or short-lived perennial herb to 1.5 m. high, cultivated only near sea level. The racemes are 12–30 cm. long and many-flowered; the petals are yellow, with red to purple veins, the keel straight, not twisted; and the seeds are about 3 mm. long, pale brown to olive-green.

TYPIFICATION: Of the references listed by Linnaeus, Sloane's Voy. Jam. Nat. Hist. may be taken to provide the lectotype material: Herb. Sloane 6: 6, and *Barham & Lane* in Herb. Sloane 67: 76 (BM LECTOSYNTYPES) (Polhill, 1971, cited above).

DISTRIBUTION: Widespread in tropical America and perhaps also indigenous in Africa and Madagascar, introduced or adventive in other parts of the tropics. The Fijian introduction falls into subsp. *purpurascens*.

- 3a. ***Crotalaria incana*** subsp. ***purpurascens*** (Lam.) Milne-Redh. in Kew Bull. **15**: 159. 1961; Polhill in Fl. Trop. E. Afr. Leg. Papil. 870. 1971.

Crotalaria purpurascens Lam. Encyl. Méth. Bot. **2**: 200. 1786.

A subspecies distinguished from subsp. *incana* by the long ferruginous indument of its stems, petioles, bracts, and calyx; the bracts are 4–10 mm. long, much more obvious than those of subsp. *incana*.

TIPIFICATION: The HOLOTYPE (P) is from a plant cultivated in Paris, originally from Madagascar.

DISTRIBUTION: Africa and Madagascar (and possibly tropical America), cultivated or naturalized elsewhere.

USE: Presumably introduced into Fiji in 1961 as a cover crop from seed sent from Kenya, but no collections indicate that it has yet become naturalized, although this may be the case.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Plant Introduction and Quarantine Station, Nanduruloulou, DA (FDA 15449).

4. *Crotalaria pallida* Ait. Hort. Kew. 3: 20. 1789; Polhill in Kew Bull. 22: 262. 1968, in Fl. Trop. E. Afr. Leg. Papil. 905. 1971; Fosberg & Sacht in Smithsonian Contr. Bot. 21: 18. 1975; Verdcourt, Man. New Guinea Leg. 582. fig. 147 (F). 1979; Henty in Papua New Guinea Dept. Forests Bull. 12: 83. pl. 26. 1980.

Crotalaria mucronata Desv. in J. Bot. Agric. 3: 76. 1814; A. C. Sm. in Sargentia 1: 39. 1942; Greenwood in J. Arnold Arb. 25: 398. 1944; Yuncker in Bishop Mus. Bull. 220: 138. 1959; Munk in Reinwardtia 6: 209. 1962; Backer & Bakh. f. Fl. Java 1: 584. 1963; J. W. Parham, Pl. Fiji Isl. 72. 1964, ed. 2. 110. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 149. 1970.

Crotalaria striata DC. Prodr. 2: 131. 1825; J. W. Parham in Dept. Agr. Fiji Bull. 35: 90. fig. 45, a-d. 1959.

Crotalaria saltiana sensu Prain ex King in J. Asiat. Soc. Bengal 66(2): 41. 1897; Christophersen in Bishop Mus. Bull. 128: 100. 1935; Yuncker in op. cit. 178: 62. 1943; Greenwood in Proc. Linn. Soc. 154: 96. 1943; non Andrews (1812).

Annual or short-lived perennial herb or shrub to 3 m. high, abundantly naturalized from near sea level to about 800 m. in open places, clearings, thickets, waste places, and cultivated areas, on sand dunes and open hillsides, and along river banks and roadsides. The racemes are up to 30 cm. long and many-flowered; the calyx is 6–7.5 mm. long, becoming deflexed against the pedicel; the petals are yellow or yellowish green, red- to purple-veined, the wings much shorter than the keel, the keel not twisted; and the seeds are about 3.5 mm. long. Flowers and fruits are seen throughout the year.

TIPIFICATION AND NOMENCLATURE: *Crotalaria pallida* was grown at Kew from seeds collected in Ethiopia by Bruce (BM HOLOTYPE); the type of *C. mucronata* is a Jamaican specimen, collector uncertain (P HOLOTYPE); and the type of *C. striata* is *Leschenault* (G HOLOTYPE), from Bengal, India. The synonymy of these taxa and the recognition of two varieties of *C. pallida* were discussed by Polhill (1968, cited above).

DISTRIBUTION: Pantropical, in part adventive and hence the original distribution obscure, but the species appears to be indigenous in parts of tropical Africa (Polhill, 1971).

This is the only abundant and widely naturalized species of *Crotalaria* in Fiji. The Fijian material appears to represent var. *obovata*, distinguishable from var. *pallida* by its distinctly obovate leaflet blades being retuse to rounded at apex and usually 3–7 × 1.5–4 cm. Variety *pallida* has elliptic, larger leaflet blades (6–13 cm. long) that are acute to rounded at apex. Perhaps both varieties occur in Pacific archipelagoes, although most material at hand represents var. *obovata*.

- 4a. *Crotalaria pallida* var. *obovata* (G. Don) Polhill in Kew Bull. 22: 265. 1968, in Fl. Trop. E. Afr. Leg. Papil. 906. 1971.

Crotalaria obovata G. Don, Gen. Hist. Dichlam. Pl. 2: 138. 1832.

TIPIFICATION: The type is *G. Don* (BM HOLOTYPE), from Accra, Ghana.

DISTRIBUTION: Widespread throughout the tropics, in part adventive, but predominant in the Old World and perhaps originally African. More than 40 Fijian collections have been examined.

LOCAL NAMES: *Rattlepod*; recorded Fijian names are *nggiringgiri*, *kaumotho*, *toela* (Mba), and *pini* (Lakemba).

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mbekana Island, near Lautoka, *Degener & Ordenez 15543*; Lautoka, *Greenwood 89*; Nandi airport, *DA 9742*; Nalotawa, eastern base of Mt. Evans Range, *Smith 4430*; Tavua, *DA 9486*; Nandarivatu, *Parks 20793*. NANDRONGA & NAVOSA: Thuvu, sand dunes along shore, *Webster & Hildreth 14316*; Keiyasi, Singatoka River, *DA 10176*. NAMOSI: Valley of Wainambua Creek, south of Mt. Naitarandamu, *Smith 8771*. RA: Yanggara, *DA 10744*; Penang, *Greenwood 89A*. NAITASIRE: Koronivia, *DA 10792*. TAILEVU: Matavatathou, *DA 9952*; Nausori, *DA 2921*. REWA: Suva Point, *DA 7487*. KANDAVU: Namalata isthmus region, *Smith 12*. WAKAYA: *Tothill 101*. VANUA LEVU: MATHUATA: Tandrandave, *DA 12944*; banks of lower Lambasa River, *Smith 6616*. LAKEMBA: Near Tumbou Village, *Garnock-Jones 915*.

The species was probably adventive in Fiji rather than intentionally introduced; it is unpalatable and is believed to be poisonous to stock. None of the available specimens are older than about 50 years; although some occur near introduction plots, that may be merely a coincidence.

5. *Crotalaria anagyroides* H. B. K. Nova Gen. et Sp. 6: 404. 1824; Yuncker in Bishop Mus. Bull. 178: 61. 1943; Munk in Reinwardtia 6: 200. 1962; Backer & Bakh. f. Fl. Java 1: 584. 1963; Polhill in Kew Bull. 22: 219. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 148. 1970; Verdcourt, Man. New Guinea Leg. 573. fig. 147 (B). 1979.

Shrub to 3 m. high, cultivated in introduction plots near sea level but perhaps also naturalized (readily naturalizing on Niue, cf. Sykes, 1970). The racemes are up to 60 cm. long and many-flowered; the pedicels are 7–10 mm. long; and the petals are yellow, sometimes purple-striped, the standard about 20 mm. in diameter.

TYPIFICATION: The species is based on material obtained near Caracas, Venezuela, by Humboldt and Bonpland.

DISTRIBUTION: Tropical America, now widely introduced elsewhere.

USES: Introduced as a cover crop or a green manure, perhaps 40 or 50 years ago, and probably becoming naturalized. In some parts of the tropics it is used as an ornamental.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Plant Introduction and Quarantine Station, Nandurulou, *DA 8491, 9566*; Central Agricultural Station, Navuso, *DA 2410*; in cocoa nursery, Principal Agricultural Station, Koronivia, *DA 12131*.

6. *Crotalaria quinquefolia* L. Sp. Pl. 716. 1753; A. Gray, Bot. U. S. Expl. Exped. 1: 390. 1854; Seem. Viti, 435. 1862; Fl. Vit. 54. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 147. 1890; Greenwood in Proc. Linn. Soc. 154: 96. 1943; Munk in Reinwardtia 6: 212. 1962; Backer & Bakh. f. Fl. Java 1: 583. 1963; J. W. Parham, Pl. Fiji Isl. 72. 1964, ed. 2. 110. 1972; Verdcourt, Man. New Guinea Leg. 582. 1979.

Erect herb or shrub to 1 m. high, apparently adventive on grassy forehills at low elevations. The racemes are terminal or distally axillary and many-flowered; the petals are yellow, red- or purple-streaked; and the fruits bear numerous seeds about 4 mm. long.

TYPIFICATION: The only reference given by Linnaeus is to Rheede, Hort. Ind. Malabar. 9: 51. t. 28. 1689.

DISTRIBUTION: Probably indigenous in India, but now pantropical.

LOCAL NAME: *Mboa*, a name recorded by early collectors.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vicinity of Tavua, *Greenwood 783*. MBENGGGA: *Tothill 100*. MATUKU: *Bryan 281*. FIJI without further locality, *U. S. Expl. Exped., Williams*

The species is seemingly adventive in Fiji and was established prior to 1840.

although it is seldom collected. Gray implied that the species may have been an intentional introduction, but there seems no evidence for this.

7. *Crotalaria grahamiana* Wight & Arn. Prodr. Fl. Ind. Orient. 194. 1834; Baker in Hook. f. Fl. Brit. Ind. 2: 85. 1876; A. Lee in *Telopea* 1: 355. 1978.

Herb or shrub to 2 m. high, cultivated near sea level but perhaps not naturalized. The inflorescences are 10–15 cm. long, the rachis copiously pilose, the bracts conspicuous, lanceolate, 10–15 mm. long, and the bracteoles are linear, paired proximally on the pedicel, this being stout and 8–12 mm. long; the calyx is large, to 15 mm. long, with acuminate lobes longer than the tube; the petals are yellow; and the fruits are stipitate, strongly and persistently beaked, and soon glabrate.

TYPIFICATION: The type was obtained in hills near Dindigul, Madras, India.

DISTRIBUTION: Presumably indigenous in India and now cultivated or perhaps naturalized elsewhere.

USE: The species was introduced into Fiji prior to 1935, perhaps as a potential cover crop.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Plant Introduction and Quarantine Station, Nanduruloulu, DA 9561, 9667.

A. T. Lee (1978, cited above) has noted that this species, naturalized in New South Wales, has sometimes been identified as *Crotalaria quinquefolia*, but it is readily distinguished by its more obvious indument, conspicuous stipules, shorter and broader leaflet blades, larger flowers, and somewhat shorter but equally inflated pods.

63. *LOTONONIS* Ecklon & Zeyher, Enum. Pl. Afr. 176. 1836; Hutchinson, Gen. Fl. Pl. 1: 360. 1964; Milne-Redh. in Fl. Trop. E. Afr. Leg. Papil. 813. 1971; Verdcourt, Man. New Guinea Leg. 585. 1979. Nom. cons.

Ononis sect. *Lotononis* DC. Prodr. 2: 166. 1825, Mém. Leg. 223. 1826.

Annual or perennial herbs, prostrate or erect, the stipules solitary and unilateral or 2 and free, rarely absent; leaves digitately 3 (or 5)-foliolate (rarely unifoliate), estipulate, the terminal leaflet the largest; inflorescences terminal or leaf-opposed, racemose or umbellate or 1-flowered, subsessile or pedunculate, the bracts and bracteoles small; calyx with the 4 upper lobes usually connate in pairs, the lowermost lobe narrower; standard ovate to obovate, short-clawed, the wings sometimes shorter than keel, the keel petals rounded at apex; stamens 10, the filaments all connate into a sheath split on vexillary side, 6 anthers short (and versatile), 4 anthers long (and basifixed); ovary sessile, the ovules numerous, the style incurved, glabrous, the stigma small, capitate; fruits oblong, compressed or slightly inflated, dehiscent, continuous within, the seeds many.

TYPE SPECIES: *Lotononis vexillata* (E. Meyer) Ecklon & Zeyher (*Crotalaria vexillata* E. Meyer). Typ. cons.

DISTRIBUTION: Mediterranean region and Africa to India, best developed in South Africa, with more than 100 species, one of which has been introduced into Fiji.

1. *Lotononis bainesii* Baker in Oliver, Fl. Trop. Afr. 2: 6. 1871; J. W. Parham, Pl. Fiji Isl. ed. 2. 114. 1972; Verdcourt, Man. New Guinea Leg. 585. fig. 148. 1979.

Prostrate, creeping, perennial herb, often rooting at nodes, cultivated and sparingly naturalized near sea level. The stipules are paired, foliaceous, 4–10 mm. long; the leaflet blades are elliptic to lanceolate, usually 2–6 × 0.5–1 cm.; the inflorescences have the rachis 1–3 cm. long borne on a peduncle to 20 cm. or more long, the short-pedicellate flowers being about 1 cm. long, the calyx with short, white, appressed hairs, and the petals yellow; and the fruits are usually about 8 × 2 mm., copiously white-pilose, and with a long-persistent style.

TYPEFICTION: The type is *Chapman & Baines* (K HOLOTYPE), collected in interior South Africa near the Tropic of Capricorn.

DISTRIBUTION: Indigenous in South Africa, now cultivated elsewhere.

USE: A pasture legume, introduced into Fiji in 1960 and becoming naturalized; it is considered palatable to stock and is protein-rich.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mba closed area, DA 13182. RA: Colonial Sugar Refining Co. Estate, Yanggara, DA 12308. NAITASIRI: Plant Introduction and Quarantine Station, Nanduruloulou, DA (FDA 15319). FIJI without further locality, DA 12961.

ORDER CONNARALES

FAMILY 126. CONNARACEAE

CONNARACEAE R. Br. in Tuckey, Narr. Exped. Congo, 431. 1818.

Trees or shrubs, often scandent, or lianas, without stipules, with indument of simple or dendroid several-many-celled hairs or glandular hairs; leaves alternate, imparipinnate, sometimes trifoliolate, rarely unifoliolate, estipellate, the petioles and petiolules basally pulvinate, the leaflets subopposite or alternate, with penninerved to triplinerved, entire blades sometimes slightly peltate at base; inflorescences axillary or terminal, sometimes borne on branches, paniculate, bracteate, the pedicels articulated distally, the flowers small, actinomorphic, hypogynous, ♂ or rarely unisexual, 5 (or rarely 4)-merous; sepals free or joined only at base, imbricate or subvalvate, usually persistent; petals free or rarely slightly connivent proximally, imbricate or valvate; stamens usually 10 (rarely 8) in 2 whorls, the inner (epipetalous) ones usually smaller, sometimes sterile or staminodial, the filaments free or shortly connate proximally, the anthers dorsifixed near base, with lengthwise, introrse dehiscence; carpels free, usually 5, sometimes 1-3, the ovules 2 (1 sometimes small and sterile), collateral, basal or ascending from ventral suture, orthotropous or anatropous, the style subulate or filiform, the stigma more or less capitate; fruits composed of often solitary (rarely 2) follicles, these sessile or stipitate, ventrally (and sometimes also dorsally) dehiscent, more rarely indehiscent or circumscissile at base, the seed usually 1 (rarely 2), with an ariloid attached to the testa, the endosperm present or absent, the cotyledons thick, flat.

DISTRIBUTION: Pantropical and extending into moist subtropical areas, with about 16 genera and 300-350 species. Two genera occur indigenously in Fiji.

USEFUL TREATMENTS OF FAMILY: SCHELLENBERG, G. *Connaraceae*. *Pflanzenr.* **103** (IV. 127): 1-326. 1938. LEENHOUTS, P. W. *Connaraceae*. *Fl. Males. I.* **5**: 495-541. 1958. DICKISON, W. C. Anatomical studies in the *Connaraceae*. I. Carpels. *J. Elisha Mitchell Sci. Soc.* **87**: 77-86. 1971. II. Wood anatomy. *Op. cit.* **88**: 120-136. 1972. III. Leaf anatomy. *Op. cit.* **89**: 121-138. 1973. IV. The bark and young stem. *Op. cit.* **89**: 166-171. 1973. DICKISON, W. C. A survey of pollenmorphology of the *Connaraceae*. *Pollen & Spores* **21**: 31-79. 1979.

KEY TO GENERA

Carpels 5 at anthesis; fruit with the follicle not stipitate, characteristically longitudinally finely striate; seed (in our species, of subgen. *Palliatius*) with a small basal sarcotesta giving rise to a loose, enveloping ariloid; calyx accrescent in fruit, cupular, often enclosing base of follicle; anthers all functional.

1. *Rourea*

Carpel 1 at anthesis; fruit with the follicle often stipitate, smooth or rugulose; seed with only a basal or proximally unilateral ariloid; calyx not accrescent in fruit; epipetalous stamens sometimes sterile or staminodial. 2. *Connarus*

1. ROUREA Aubl. *Hist. Pl. Guiane Fr.* 467. 1775; Seem. *Fl. Vit.* 53. 1865; Schellenb. in *Pflanzenr.* **103** (IV. 127): 194. 1938; Leenh. in *Fl. Males. I.* **5**: 510. 1958; Hutchinson, *Gen. Fl. Pl.* **1**: 166. 1964; Tirvengadam in *Rev. Handb. Fl. Ceylon I*: 280. 1980. *Nom. cons.*

Kalawael Adanson, Fam. Pl. 2: 344, 530. 1763. Nom. rejic.

Santalodes Kuntze, Rev. Gen. Pl. 1: 155, p. 1891. Nom. rejic.

Santaloides Schellenb. in Mitt. Bot. Mus. Univ. Zürich 50: 38. 1910, in Pflanzenr. 103 (IV. 127): 119. 1938; Hutchinson, Gen. Fl. Pl. 1: 166. 1964. Nom. cons.

Shrubs, small trees, or lianas, the indument sometimes composed of several-celled hairs; leaves imparipinnate, sometimes trifoliolate, rarely unifoliolate; inflorescences axillary, sometimes pseudoterminal, paniculate, the bracts ovate to lanceolate, the bracteoles small, lanceolate, fimbriate, the flowers ♂, 5-merous; sepals distinctly imbricate, ovate, acute, usually pilose without, accrescent in fruit; petals longer than sepals, glabrous; stamens 10, the filaments filiform, joined at base, glabrous, the 5 episepalous ones distinctly the longer, the anthers all functional; carpels 5, heterotri-stylous, the ovary obliquely ovoid, pilose or subglabrate, the ovules suborthotropous, the style slender, the stigma small, capitate or oblique; fruits composed of 1 (very rarely 2) follicle, this ellipsoid to ovoid, usually slightly curved, longitudinally finely striate, ventrally (as in our species) or irregularly dehiscent, the pericarp thin but coriaceous, the seed solitary, ellipsoid to subglobose and laterally somewhat flattened, the testa entirely fleshy or the basal portion forming a small sarcotesta or the basal sarcotesta (as in our species) giving rise to a loose arillode enveloping or slightly shorter than the seed, the hilum large and basal or (as in our species) small and lateral near base.

TYPE SPECIES AND NOMENCLATURE: *Rourea* is based on *R. frutescens* Aubl.; *Kalawael* (as discussed by Leenhouts, 1958) on "*Kiridiwael*" Hermann (*Santaloides* L., 1747) = *Rourea minor* (Gaertn.) Alston. The type species of *Santalodes* may be considered *S. hermannianum* Kuntze (*Connarus santaloides* Vahl) = *Santaloides minus* (Gaertn.) Schellenb. The conserved type species of *Santaloides* is *S. minus* (Gaertn.) Schellenb. (*Aegiceras minus* Gaertn.) = *Rourea minor* (Gaertn.) Alston. The three genera listed in synonymy are all ultimately based on the Ceylonese plant now known as *Santaloides minus* (in Schellenberg's system) or *Rourea minor* (as interpreted by Leenhouts). *Santaloides* is conserved against *Kalawael* and *Santalodes*, but not against *Rourea*.

DISTRIBUTION: Pantropical, with about 100 species, the Asian-Pacific portion of the range extending eastward to Niue and Samoa.

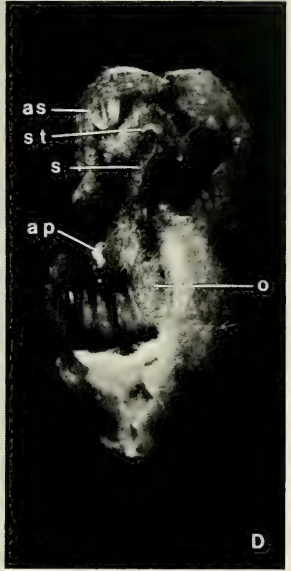
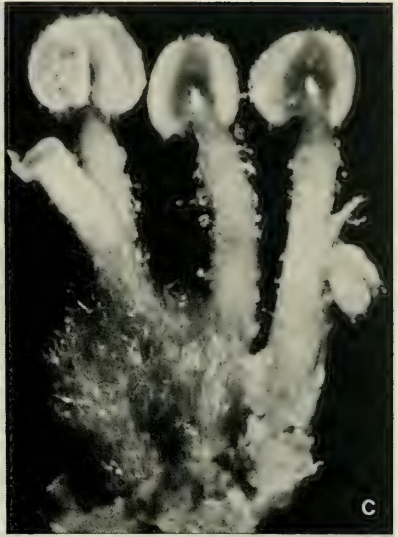
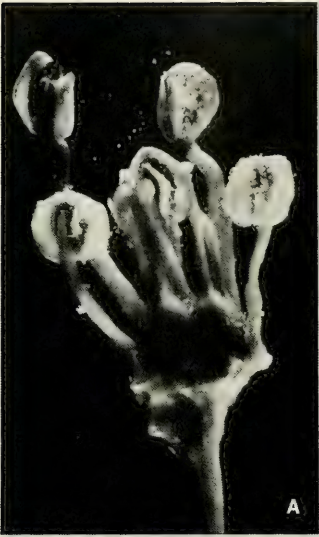
Leenhouts (1958) has provided a detailed justification for his use of *Rourea* in a comprehensive sense, combining five genera distinguished by Schellenberg (1938). These genera appear to differ only in the degree of development of the sarcotesta, which may cover the whole seed or only a small basal part of it, from which in a late stage of ontogeny may develop an arillode which loosely envelops the whole seed. The last situation characterizes *Santaloides* Schellenb. (= *Rourea* subgen. *Palliatius* Leenh.). Anatomical and palynological evidence supporting this inclusive concept of *Rourea* has been summarized by Dickison (in J. Elisha Mitchell Sci. Soc. 88: 129. 1972, in op. cit. 89: 137. 1973, in Pollen & Spores 21: 70. 1979). Even though they are separated only by seed characters, the three subgenera recognized by Leenhouts are sharply demarcated and all have valid names, but the inclusive concept of *Rourea* now seems generally accepted as reasonable.

1. *Rourea minor* (Gaertn.) Alston in Trimen, Handb. Fl. Ceylon 6: 67, as *R. minus*. 1931; Leenh. in Fl. Males. I. 5: 514. fig. 8. 1958; Vidal in Fl. Cambodge, Laos et Vietnam 2: 34. 1962; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 70. fig. 4. 1970; Tirvengadam in Rev. Handb. Fl. Ceylon 1: 280. 1980.

FIGURES 47, 48A, 49A & B.



FIGURE 47. *Rourea minor*; A, distal portion of branchlet, with foliage and infructescences, $\times 1/3$; B, distal portion of branchlet, with unifoliolate leaves and an infructescence, $\times 1/3$; C, flower, with 2 sepals and 2 petals removed, some anthers fallen, $\times 10$; D, indument of lower surface of young leaflet blade, $\times 50$. A from Smith 8870, B from Smith 6890, C from Vaupel 491 (Samoa), D from Smith 9567.



Aegiceras minus Gaertn. Fruct. Sem. Pl. 1: 216. t. 46. 1788.

Rourea heterophylla Planch. in Linnaea 23: 419. 1850; A. Gray, Bot. U. S. Expl. Exped. 1: 375. 1854; Seem. Viti, 435. 1862, Fl. Vit. 53. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 146. 1890.

Rourea samoensis Lauterb. in Bot. Jahrb. 41: 226. 1908.

Santaloides samoense Schellenb. in Bot. Jahrb. 58: 180. 1923, in Pflanzenz. 103 (IV. 127): 122. 1938; Yuncker in Bishop Mus. Bull. 220: 128. 1959; St. John & A. C. Sm. in Pacific Sci. 25: 327. 1971.

Santaloides minus Schellenb. in Bot. Jahrb. 59: Beibl. 131: 28. 1924, in Pflanzenz. 103 (IV. 127): 126. 1938.

Santaloides vitiense Schellenb. in Pflanzenz. 103 (IV. 127): 135. 1938; J. W. Parham, Pl. Fiji Isl. 60. 1964, ed. 2. 93. 1972.

Derris sp. Yuncker in Bishop Mus. Bull. 178: 63. 1943.

A high-climbing liana developing from a scandent shrub, found from near sea level upward to about 600 m. in dry forest, often on ridges, or in patches of forest in open country. Fijian specimens have the leaves and branchlets glabrous but sometimes with an evanescent indument of crispate, many-celled hairs; the leaves usually have (3-) 5-7 leaflets, these with ovate to narrowly elliptic or lanceolate blades usually 3-8 × 1.5-4 cm. and with veinlet reticulation diverse, inconspicuous to obvious, lax to tessellate. Rarely the leaves are unifoliate, the blades then being deltoid-ovate, subcordate, and as large as 14 × 7 cm. (FIGURE 47B). The flowers have white petals and filaments and yellow anthers. The pericarp of the follicle is brown to dull reddish-tinged, the arillode being orange to bright red. Flowers have been obtained between December and May, fruits throughout much of the year.

TYPIIFICATION AND NOMENCLATURE: *Aegiceras minus* is based upon fruits collected by J. G. König in Ceylon (L carpologica 1163 HOLOTYPE); *Rourea heterophylla* is typified by *Cuming 752* (κ probable HOLOTYPE), Prov. Tayabas, Luzon, Philippine Islands. The type of *Rourea samoensis* is *Vaupel 491* (B HOLOTYPE probably destroyed; 2 ISOTYPES at BISH), collected Dec. 14, 1905, at Lealatele, Savaii, Samoa; that of *Santaloides vitiense* is *Storck 1* (κ HOLOTYPE), from Fiji but without further locality. Numerous other names are reduced to *R. minor* by Leenhouts (1958), only those mentioned in literature pertaining to the Fijian Region being here mentioned.

DISTRIBUTION: India and Ceylon through Malesia to northeastern Australia, New Caledonia, and Samoa. In western Polynesia the species is now known from Tonga, Niue, Futuna, and Samoa.

LOCAL NAMES: *Wa lo* (Nandronga & Navosa) and *wa vatu* (Mathuata) have each been recorded once.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Nausori Highlands, *DF 428*, *Vetawa 21*. SERUA: Mbuymbuoy, near Namboutini, *Tabualewa 15599*; Vatuvilakia, vicinity of Ngaloa, *Degener 15138*; coastal hills in vicinity of Taunovo River, east of Wainiyambia, *Smith 9567*. NAMOSTI: Hills bordering Wainavindrau Creek, vicinity of Wainimakutu, *Smith 8870*. NAITASIRE: Lower Waindina Valley, *DA 917*; 9 miles from Suva, *Meebold 16653*. OVALAU: In mountains, *Horne 349*, *394*. VANUA LEVU: MBUA: Kukuruku Bay area, *H. B. R. Parham 98*, *377*. MATHUATA: Seangangga Plateau, in drainage of Korovuli River, vicinity of Natua, *Smith 6890*; vicinity of Lambasa, *Greenwood 470*. VANUA LEVU without further locality, *U. S. Expl. Exped.*

The broad concept of *Rourea minor* adopted by Leenhouts (1958) may be subdivided by some authors (e. g. Vidal, 1962 cited above, where three subspecies are recognized), but it seems difficult to perceive well-delimited taxa in the Papuasian-Pacific portion of the range. Subspecies *minor* is fairly diverse in Fiji as to number and shape of leaflets and type of venation, indicating that there have been repeated

FIGURE 48. A, *Rourea minor*; androecium (with 5 stamens removed) and gynoecium, × 20. B-D, *Connarus pickeringii*; B, leaf and axillary inflorescence, × 1/4; C, gynoecium of young flower, with 3 episepalous stamens and 1 epipetalous stamen (other stamens removed), × 30; D, flower with 2 sepals and 2 petals removed, most anthers fallen, × 10, showing ovary (o), style (s), stigma (st), anther of episepalous stamen (as), and anther of epipetalous stamen (ap). A from *Vaupel 491* (Samoa), B from *Smith 1072*. C & D from *Smith 7273*.

incursions of disseminules from farther west. In western Polynesia a pronounced diminution of diversity is apparent: there the indument is practically lacking and the leaflets are usually 5-7, with ovate to elliptic, notably acuminate blades up to 10 × 6 cm., with coarse but comparatively inconspicuous veinlet reticulation.

An interesting contrast may be noted in the representation of *Rourea* and *Connarus* in the Fijian Region. The arillode of the seed of the highly variable *Rourea minor* (FIGURE 49B) is of a color and texture presumably inviting to birds, whereas the arillode of the *Connarus* seed (FIGURE 49D) is small and yellowish, perhaps not attracting birds, and the seed is substantially larger than that of *Rourea*. It is noteworthy that *Connarus* has apparently not been recorded from the New Hebrides, that the Fijian *C. pickeringii* is not very variable and is sharply distinct from any Papuanian relative, and that the population of *Connarus* recently discovered in Tonga seems discrete.

2. *CONNARUS* L. Sp. Pl. 675. 1753; Seem. Fl. Vit. 53. 1865; Schellenb. in Pflanzenr. 103 (IV. 127): 216. 1938; A. C. Sm. in J. Arnold Arb. 36: 279. 1955; Leenh. in Fl. Males. I. 5: 525. 1958; Hutchinson, Gen. Fl. Pl. 1: 167. 1964; Tirvengadam in Rev. Handb. Fl. Ceylon 1: 282. 1980.

Shrubs, small trees, or lianas; leaves imparipinnate, sometimes trifoliolate, rarely unifoliolate, the leaflets opposite or subalternate, with pellucid-glandular-punctate blades; inflorescences terminal and/or axillary, paniculate, often ample, the flowers ♀, fragrant, 5-merous, the perianth parts and stamens glandular-punctate; sepals connate at base, imbricate or subvalvate, usually thick and fleshy, persistent in fruit but not accrescent; petals free, imbricate in bud, cohering below middle before anthesis, usually glandular-ciliate proximally, often pilose with sometimes capitate-glandular hairs; stamens 10, the filaments connate at base, usually glandular-pilose, the epipetalous ones the shorter and sometimes sterile or staminodial, the connective apically tufted-glandular-pilose; carpel 1, often densely pilose, heterodistylous, the ovary subglobose, the style distally glandular-pilose, the stigma capitate; mature follicle dehiscent ventrally and sometimes also dorsally, often narrowed into a stipe, the dorsal suture usually straight, the ventral suture convex or sinuate, the style remnant often subsistent, the pericarp chartaceous to woody, the seed with a shining, purple to black testa, basally enveloped by or unilaterally bearing a fleshy, yellowish arillode, this attached just below hilum, subpeltate, bilobed, lacerate, or crenulate.

TYPE SPECIES: *Connarus monocarpus* L., the only original species.

DISTRIBUTION: Pantropical, with about 100 species, the Asian-Pacific segment extending eastward to Fiji and Tonga. One species is endemic in Fiji.

Previous indications (Smith in J. Arnold Arb. 36: 279. 1955; van Balgooy in Blumea Suppl. 6: 167. 1971) that the range of *Connarus* terminates in Fiji requires correction. In recent years both W. R. Sykes and G. P. Buelow have obtained Tongan material of *Connarus*, now known to occur on Vava'u and 'Eua. Their collections apparently represent an undescribed species, differing from the Fijian *C. pickeringii*, among other characters, in having fruits and seeds about twice as large at maturity.

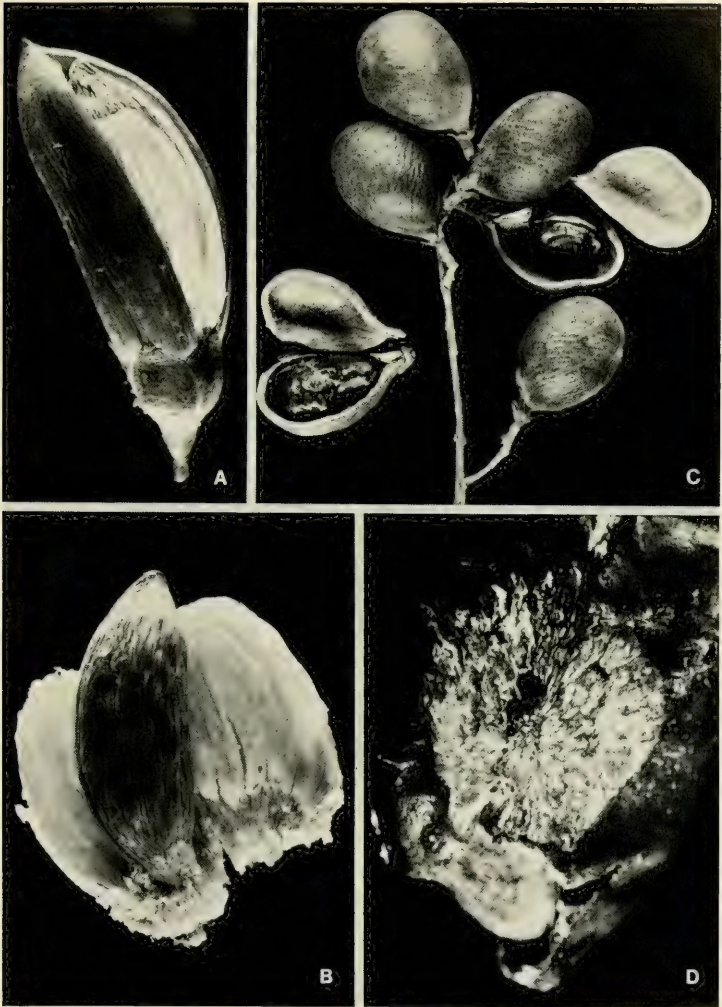


FIGURE 49. A & B, *Rourea minor*: A, fruit in accrescent calyx, ventrally dehiscent to show seed and arillode, $\times 4$; B, seed with arillode partly detached from basal sarcotesta and spread open, $\times 4$. C & D, *Connarus pickeringii*: C, portion of infructescence, $\times 1$; D, base of seed and arillode, $\times 8$. A & B from Smith 8870, C from Bryan 522 (detached fruit from Meebold 16518), D from Meebold 16518.

1. *Conarus pickeringii* A. Gray, Bot. U. S. Expl. Exped. 1: 375. 1854, Atlas, pl. 45. 1856; Seem. in Bonplandia 9: 255. 1861, Viti, 435. 1862, Fl. Vit. 53. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 146. 1890; Schellenb. in Pflanzenr. 103 (IV. 127): 261. 1938; A. C. Sm. in J. Arnold Arb. 36: 279. 1955; J. W. Parham, Pl. Fiji Isl. 60. 1964, ed. 2. 93. 1972.

FIGURES 48B-D, 49C & D.

High-climbing liana or scandent shrub, often frequent at elevations from near sea level to 900 m. in dense, dry, or secondary forest, on its edges, or in thickets. The young parts are copiously ferruginous-tomentose, the indument being dense and subpersistent on inflorescences; the leaflets are (3-) 5-7, the blades lanceolate- to ovate-oblong, 8-21 × 3-9 cm., with 3-6 curved-ascending secondary nerves. The inflorescences are usually shorter than the leaves at anthesis but often greatly exceed the leaves in fruit. The petals are white to cream-colored or dull yellow, short-ferruginous-tomentose on both sides and orange-glandular-punctate; the filaments are dull yellow and glandular-pilose, the anthers yellow. Mature follicles are orange-brown, 2.5-3 × 1.5-2 × 1.4-1.6 cm., the pericarp with long-persistent indument but eventually subglabrate, finely rugulose, and often faintly obliquely striate, the seed turning from cream-colored to black and shining, the arillode yellow with darker mottling. Flowers and fruits occur throughout the year.

TYPIFICATION: The type is *U. S. Expl. Exped.* (US 44130 HOLOTYPE; putative ISOTYPES at GH, K), collected in 1840; three localities are given by Gray: Ovalau, Viti Levu (Rewa), and Vanua Levu, but specific localities cannot be associated with the specimens.

DISTRIBUTION: Endemic to Fiji and to be expected throughout the group, from which about 65 collections are available.

LOCAL NAMES AND USES: Most frequently used names are *wa vatu*, *mbilitoi*, *wa vutu*, and *sekau*; names used locally and perhaps not reliable are *wa tele* (Serua), *wa tandangwala* (Namosi), *wa tanggola* (Tailevu), *katikatithanggala* (Mbua), *thanggala ni mbune* (Thakaundrove), and *ndawandawa* (Moala, Koro). The leaves, even when green, are rolled up and used for smoking, the stems are used for binding house timbers, and the species is reputed to have medicinal properties.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: North of Yalombi, along Olo Creek, *St. John 18130*. VITI LEVU: MBA: Naloto Range, *DA 14768*. NANDRONGA & NAVOSA: Northern portion of Rairaimatuku Plateau, between Nandrau and Nanga, *Smith 5521*. SERUA: Mbuyombuyo, near Namboutini, *Tabualewa 15611*; coastal hills in vicinity of Taunovo River, east of Wainiyambia, *Smith 9605*. NAMOSI: Mt. Naitarandamu, *Gillespie 3099*; Wainandoi River, *DA 16971*. NAITASIRI: Matawailevu, Wainamo Creek, Wainimala Valley, *St. John 18178*; Viria, *Meebold 16518*; Tamavua, *Yeoward 60*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7126*. REWA: Mt. Korombamba, *DA 16522*. VITI LEVU and OVALAU: *Seemann 101*. OVALAU: Hills east of Lovoni Valley, *Smith 7273*; northwest of Levuka, *Gillespie 4554*. KORO: Western slope, *Smith 1072*. NGAU: Slopes of Mt. Ndelaiho, on northern spur, toward Navukailangi, *Smith 7865*. VANUA LEVU: MBUA: Upper Ndama River Valley, *Smith 1585*. MATHUATA: Mountains along coast, *Greenwood 610A*. THAKAUNDRIVE: Mt. Kasi, Yanawai River region, *Smith 1767*; Wainigata, near Savusavu, *DA 13120*. RAMBI: *Horne*, March, 1878. TAVEUNI: Vicinity of Waiyevo, *Gillespie 4715*. MOALA: Above Maloku, *Smith 1351*. AIWA: Central forest, *Bryan 522*. FULANGA: On limestone formation, *Smith 1143*.

Conarus pickeringii has no very close relatives among Malesian-Papuan species, but as indicated by Leenhouts (1958) it is suggestive of *C. salomoniensis* Schellenb. in foliage, differing sharply in its more obvious indument, much larger flowers, substantially smaller follicles with long-persistent tomentum, and seeds with smaller arillodes.

ORDER MYRTALES

The order Myrtales has been variously interpreted, most often as a comprehensive group of families some of which are not necessarily closely related. Briggs and Johnson (1979) have discussed the underlying problems in considerable detail, concluding that many families often included in Myrtales (such as, in our area, Thymelaeaceae, Lecythidaceae, and Rhizophoraceae, already treated in Volume 2 of the present *Flora*) should be excluded. With these and other exclusions, the Myrtales may be considered to comprise no more than about twelve families, but even these are placed in two orders, Myrtales and Lythrales, by Briggs and Johnson on the basis of ovule and seed structure. However, the reliability of such characters is questioned by Schmid (in Taxon 29: 588. 1980), and at best they are difficult to analyze. The order Myrtales, including the Lythrales but with the exclusions mentioned above, is represented in Fiji by six families.

KEY TO FAMILIES OCCURRING IN FIJI

- Flowers perigynous or rarely slightly semi-epigynous, the ovaries superior (or rarely slightly semi-inferior and proximally adnate to hypanthium), completely or incompletely 2-6-locular or rarely 1-locular, each locule with 2-many ovules on an axile (parietal in 1-locular ovaries) placenta; stamens often twice as many as calyx lobes, sometimes fewer or numerous, the filaments elongate; flowers strongly perigynous, the hypanthium prominent, with valvate calyx lobes often alternating with appendages; fruits usually capsular and dry. 127. LYTHRACEAE
- Flowers epigynous or nearly so (in all our genera), the ovaries adnate to hypanthium or attached to it by septa.
- Stamens mostly numerous (3 or more times as many as calyx lobes in all our taxa).
- Ovary 2-12-locular (in all our taxa, but rarely 1-16-locular); fruit baccate or capsular (or sometimes a drupe or a nut but not in our taxa), dehiscent or not but only rarely both many-seeded and indehiscent; leaf blades glandular-punctate. 128. MYRTACEAE
- Ovary (3-)-7-9(-15)-locular; fruit indehiscent, with many seeds embedded in a pulpy mass; leaf blades not glandular-punctate. 129. PUNICACEAE
- Stamens (in all our taxa) not more than twice as many as calyx lobes.
- Placentation axile, less often basal or parietal or free central; fruit a capsule, berry, or nut, the seeds numerous to seldom few (rarely only 1).
- Anthers dehiscing by longitudinal slits, the connective lacking appendages; leaf blades pinnately veined; plants (our representatives) herbs or small shrubs. 130. ONAGRACEAE
- Anthers usually dehiscing by terminal pores (less often by longitudinal slits), the connective often thickened at base and with appendages; leaf blades usually with 3 or more conspicuous longitudinal nerves, less often (only *Mecycylon* in our area) pinnately veined; plants usually woody. 131. MELASTOMATACEAE
- Placentation apical in a compound, 1-locular ovary, the ovules 2-6; fruit a 1-seeded pseudocarp, usually indehiscent; plants woody. 132. COMBRETACEAE

FAMILY 127. LYTHRACEAE

LYTHRACEAE J. St.-Hil. Expos. Fam. Nat. 2: 175, as *Lythraeae*. 1805.

Herbs, shrubs, or trees, the stipules small or lacking; leaves opposite or verticillate, rarely spiralled, the blades simple, entire; inflorescences axillary and/or terminal, paniculate, racemose, cymose, or 1-flowered (usually extra-axillary in *Cuphea*), the pedicels usually bibracteolate, the flowers actinomorphic or less often zygomorphic, ♂, perigynous, usually 4- or 6-merous; calyx gamosepalous, composed of sepals united into a tube (hypanthium), the lobes valvate, often alternating with appendages; petals as many as calyx lobes or fewer or lacking, inserted toward apex of hypanthium, crumpled in bud, imbricate, often fugacious; stamens often twice as many as calyx

lobes, sometimes fewer or numerous, inserted on hypanthium below petals, the filaments variable in length, usually inflexed in bud, the anthers 2-locular, dorsifixed near base, dehiscing lengthwise; disk sometimes present, cupular or unilateral; ovary superior, sessile or short-stipitate, completely or incompletely 2-6-locular or rarely 1-locular, each locule with 2-many ovules on an axile placenta that is sometimes free distally (or parietal when ovary is 1-locular), the ovules anatropous, ascending, the style simple, variable in length, the stigma usually capitate or punctiform; fruits usually capsular, dry, dehiscing by transverse slits, by valves, or irregularly, the seeds 2-numerous, winged or not, without endosperm, the embryo straight.

DISTRIBUTION: Widespread in tropical, subtropical, and temperate areas, most abundant in America, with about 22 genera and 500 species, including many of horticultural value. Four genera are known to occur in Fiji, only one of them with an indigenous species.

USEFUL TREATMENTS OF FAMILY: KOEHNE, E. *Lythraceae*. *Pflanzenr.* 17 (IV. 216): 1-326. 1903. BACKER, C. A., & R. C. BAKHUIZEN VAN DEN BRINK, JR. *Lythraceae*. *Fl. Java* 1: 251-256. 1963.

KEY TO GENERA

- Inflorescences axillary or extra-axillary, racemose or the flowers solitary or paired; flowers 6-merous; dissepiments of ovary discontinuous distally above placenta.
- Flowers zygomorphic; hypanthium tubular, longitudinally ribbed, often basally calcarate; petals (in our species) 6, 2, or none; stamens (in our species) 11; ovary incompletely 2-locular; fruit and hypanthium longitudinally split by the reflexed maturing placenta, the seeds lenticular, narrowly circumalate by a thin wing; adventive or cultivated. 1. *Cuphea*
- Flowers actinomorphic; hypanthium campanulate-cyathiform; petals 6; stamens (in our species) 12; ovary unilocular; fruit circumscissile, the seeds compressed-cuneate, circumalate by a thickened wing; indigenous and coastal. 2. *Pemphis*
- Inflorescences terminal and axillary, forming leafy panicles at branchlet apices; flowers actinomorphic; dissepiments of ovary complete to apex; cultivated or sparingly naturalized.
- Flowers (4-)(6-)(9)-merous; petals obviously clawed; stamens 15-numerous, 1-several-seriate, both episepalous and epipetalous; capsule loculicidally 3-6(-7)-valved, the seeds apically produced into a large cultriform wing. 3. *Lagerstroemia*
- Flowers 4-merous; petals minutely clawed; stamens 8 (4-13), all episepalous; capsule indehiscent (or irregularly rupturing), the seeds unwinged, obpyramidal, the testa thickened and spongy apically. 4. *Lawsonia*

1. *CUPHEA* P. Br. *Hist. Jam.* 216. 1756; Koehne in *Pflanzenr.* 17 (IV. 216): 80. 1903.

Parsonsia P. Br. *Hist. Jam.* 199. 1756. *Nom. rejic. vs. Parsonsia* R. Br. (1810; *nom. cons. Asclep.*).

Herbs or small shrubs, sometimes spiny, sometimes glandular-pilose; leaves opposite or verticillate (very rarely alternate); inflorescences usually extra-axillary, the flowers solitary or fasciculate or in leafy racemes, zygomorphic, 6-merous, the bracteoles 2 (as in all our species), infrequently lacking; hypanthium tubular, longitudinally ribbed, often calcarate at base with a nectariferous spur, the lobes short, often alternating with tubercles or accessory teeth; petals 6, rarely 2 or none, less often 4, often unequal, clawed or not; stamens 11 (as in all our species), rarely fewer (9, 6, or 4), often unequal, the filaments usually protruding from calyx at anthesis; disk scalelike or tubercular, dorsally unilateral or rarely cupuliform or lacking; ovary sessile, incompletely 2-locular, the placenta axile, the ovules 2-4 or usually more, the style filiform; fruit enclosed by hypanthium, thin-walled, dehiscing on one side together with hypanthium, the placenta protruding, the seeds lenticular, 2-4 or more, flat, often narrowly circumalate.

TYPE SPECIES: *Cuphea viscosissima* Jacq.

DISTRIBUTION: Western Hemisphere, with about 250 species, among which are many ornamentals. Five species are recorded from Fiji, four in cultivation and one a widespread adventive.

KEY TO SPECIES

Calyx tube (hypanthium) 4.5–8 mm. long; ovules 4–8; petals 6, rich pink (or nearly white) to purplish, 2–5 mm. long.

Stems and branches viscid-pilose; leaf blades ovate to elliptic, variable in size, (10–) 20–60 × (4–) 6–25 mm., the petiole negligible or to 10 mm. long; pedicels short, 1–2 mm. long; hypanthium pink to mauve, sparsely hispidulous; abundant adventive. 1. *C. carthagensis*

Stems and branches glabrous or minutely pilose; leaf blades subsessile, linear- to lanceolate-oblong, 7–20 × 2–5 mm.; pedicels 2.5–7.5 mm. long; hypanthium green, glabrous or minutely hispidulous; cultivated only. 2. *C. hyssopifolia*

Calyx tube (hypanthium) longer, 18 mm. or more long; ovules comparatively numerous (14 or more); cultivated only.

Petals 2 or 6; hypanthium more than 20 mm. long, without a basal spur or this inconspicuous; ovules 18 or more.

Leaf blades ovate to lanceolate, 30–80 × 6–25 mm., usually about 4 times longer than broad; pedicels 2–4 mm. long; hypanthium 20–40 mm. long, green to purplish, copiously hirsute; petals 2, bright red, conspicuous, usually 7–10 mm. long; ovules 18–25. 3. *C. llavea*

Leaf blades lanceolate, 40–80 × 8–15 mm. or larger, usually 5 or 6 times longer than broad; pedicels obvious, about 5 (3–11) mm. long; hypanthium 20–30 mm. long, scarlet proximally, yellowish at apex, glabrous to sparsely hispidulous; petals 6, white to yellow, minute; ovules 60–120.

4. *C. micropetala*

Petals lacking; hypanthium slender, 18–26 mm. long, glabrous, with an obvious, rounded basal spur, bright red, apically violet and white; ovules 14–20; pedicels obvious, slender, 5–12 (–20) mm. long; leaf blades oblong to lanceolate, 20–40 × (4–) 6–20 mm. or larger, 2–3 times longer than broad.

5. *C. ignea*

1. *Cuphea carthagensis* (Jacq.) Macbr. in Publ. Field Columbian Mus., Bot. Ser. 8: 124. 1930; A. C. Sm. in Sargentia 1: 73. 1942; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 17: 25. 1946; J. W. Parham in op. cit. 19: 103, as *C. carthaginensis*. 1948, in Dept. Agr. Fiji Bull. 35: 51, fig. 19. 1959, Pl. Fiji Isl. 228. 1964, ed. 2. 317. 1972; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 47, as *C. carthagensis*. 1972.

Lythrum carthagense Jacq. Select. Stirp. Amer. 148. 1763.

Cuphea balsamona Cham. & Schlechtendal in Linnaea 2: 363. 1827; Koehne in Pflanzenr. 17 (IV. 216): 122, fig. 16, D. 1903; Greenwood in Proc. Linn. Soc. 154: 98, as *C. balsamina*. 1943.

Annual, erect, freely branching, suffruticose herb to 1 m. high, with stems and branches viscid-pilose, found from near sea level to an elevation of 1,125 m. as a sometimes abundant weed in gardens, plantations, and open fields, along roadsides and forest trails, and in open places on ridges and crests. Flowers and fruits are found throughout the year.

TIPIFICATION AND NOMENCLATURE: *Lythrum carthagense* is based on a Jacquin collection from Cartagena, Colombia; *Cuphea balsamona* on a plant from the vicinity of Rio de Janeiro, Brazil, said to be illustrated in Vandelli, Fl. Lus. et Bras. Spec. 30. t. 4. 1788. Since Macbride pointed it out, Jacquin's epithet has been generally recognized as the correct one for this taxon.

DISTRIBUTION: Tropical America, now widespread throughout the tropics as a weed. It was first noted in Fiji during the 1920's and has spread rapidly, about 60 Fijian collections, mostly from Viti Levu, being at hand.

LOCAL NAMES: *Tar weed*; *lasahia*; *kerisi*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Nandarivatu, *Tohill 202*; summit of Mt. Nanggara-nambuluta, *Smith 4816*. NANDRONGA & NAVOSA: Singatoka, *Greenwood 786* (coll. H. R. SurrIDGE); northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, *Smith 5391*. SERUA: Vicinity of Ndeumba, *McKee 2748*; vicinity of Navua, *DA 10533*. NAMOSI: Valley of Wainavindrau Creek, vicinity of Wainimakutu, *Smith 8815*. RA: Pasture Seed and Production Farm, Ndombulevu, *DA 9523*. NANTASIRE: Vicinity of Vunindawa, *DA 10037*; Sawani-Serea road, *DA 11506*; Plant Introduction and Quarantine Station, Nanduruloulou, *DA 9806*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna,

Smith 7005: Wainimbokasi, *DA 10578*. REWA: Suva, *DA 12236*. VANUA LEVU: THAKAUNDOVE: Along Hibiscus Highway east of Savusavu, *Bierhorst F173*. TAVEUNI: Waimanggera, *DA 8927*. LAKEMBA: Near Tumbou Village, *Garnock-Jones 921*.

2. *Cuphea hyssoipifolia* H. B. K. *Nova Gen. et Sp.* 6: 199. 1824; Koehne in *Pflanzenr.* 17 (IV. 216): 127. *fig. 17, A.* 1903; J. W. Parham, *Pl. Fiji Isl.* ed. 2. 317. 1972.

Compact, freely branched shrub 30–60 cm. high, occasionally cultivated near sea level. The only available specimen was flowering in March.

TYPIFICATION: The type was collected by Humboldt and Bonpland near Jalapa, Chiapas, Mexico.

DISTRIBUTION: Mexico and Central America, now cultivated in many tropical countries.

LOCAL NAME AND USE: *False heather*, an attractive, compact, small-leaved plant, is a pleasing ornamental.

AVAILABLE COLLECTION: VITI LEVU: REWA: Lami, in private garden, *DA 16791*.

3. *Cuphea llavea* Lex. in *La Llave & Lex. Nov. Veg. Descr.* 1: 20. 1824; Koehne in *Pflanzenr.* 17 (IV. 216): 155. *fig. 21, C* (var. *barbigera*). 1903; J. W. Parham, *Pl. Fiji Isl.* ed. 2. 317. 1972.

Coarse, subligneous herb to 60 cm. high, sparsely cultivated near sea level. The cited collection was in flower in July.

TYPIFICATION: The original publication notes as the locality Mexico, in mountains "prope Vallisoleum."

DISTRIBUTION: Mexico, cultivated in the nineteenth century in European greenhouses as an ornamental and used as a parent of garden hybrids, such as *Cuphea* × *purpurea* Lem. (*C. llavea* × *C. procumbens* Cav.), with six petals. Our material does not permit positive identification.

AVAILABLE COLLECTION: VITI LEVU: TAILEVU: Wainimbokasi, *DA 2590*.

4. *Cuphea micropetala* H. B. K. *Nova Gen. et Sp.* 6: 209. *t. 551*. 1824; Koehne in *Pflanzenr.* 17 (IV. 216): 161. *fig. 22, D.* 1903; J. W. Parham, *Pl. Fiji Isl.* ed. 2. 317. 1972.

Subligneous herb or shrub to 1 m. high, occasionally cultivated near sea level. Flowers were obtained in March.

TYPIFICATION: Noted as obtained in a Mexican botanical garden.

DISTRIBUTION: Mexico, now widely cultivated in tropical and subtropical countries.

USE: The species is an attractive ornamental.

AVAILABLE COLLECTION: VITI LEVU: REWA: Lami, in private garden, *DA 16454*.

5. *Cuphea ignea* A. DC. in *Fl. Serres Jard. Eur.* 5: 500C. 1849; J. W. Parham, *Pl. Fiji Isl.* ed. 2. 317. 1972.

Cuphea platycentra Lem. in *Fl. Serres Jard. Eur.* 2: *t. 180*. 1846, in *Paxton's Mag. Bot.* 13: 267. 1846; Koehne in *Pflanzenr.* 17 (IV. 216): 167. *fig. 23, E.* 1903; non Benth. (1839).

An essentially glabrous shrub to 1 m. high, sometimes cultivated near sea level. Our material was flowering in November.

TYPIFICATION: De Candolle described the species from a plant cultivated in Van Houtte's garden, indicating that it was then growing at Geneva and elsewhere. Lemaire's illegitimate name was also based on a cultivated plant.

DISTRIBUTION: Mexico and perhaps the West Indies, introduced into greenhouse cultivation in the nineteenth century and a parent of various hybrids.

LOCAL NAMES AND USE: *Cigar flower; firecracker plant*. Its bright red flowers and graceful habit make the species a desirable ornamental.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRE: Mbatiki Nursery, Nanduruloulou, DA 3006.

2. PEMPHIS J. R. & G. Forst. Char. Gen. Pl. 34. 1775, ed. 2. 67. 1776; Koehne in Pflanzenr. 17 (IV. 216): 185. 1903.

Unarmed trees or shrubs, the leaves decussate, subsessile, small; inflorescences axillary, the flowers solitary or paired, short-pedicellate, actinomorphic, 6-merous, heterostylous, the bracteoles at base of pedicel fugacious; hypanthium campanulate-cyathiform, persistent, the lobes broadly deltoid, alternating with small, subulate or callose-tuberculate accessory lobes; petals 6, elliptic-obovate, crispate, caducous; stamens 12 (as in our species) or 18, the filaments alternately slightly unequal; ovary sessile or stipitate, subglobose, unilocular, the placenta central, usually about half as long as the locule, the ovules numerous, the style filiform, persistent, the stigma bilobed; capsule obovoid to ellipsoid, not or hardly exceeding calyx, circumscissile, the seeds numerous, compressed-cuneate, circumalate, the wing margin thick, almost corky.

TYPE SPECIES: *Pemphis acidula* J. R. & G. Forst.

DISTRIBUTION: Paleotropical, with two species, one widespread and the other endemic to Madagascar.

1. *Pemphis acidula* J. R. & G. Forst. Char. Gen. Pl. 34. t. 34. 1775, ed. 2. 68. t. 34. 1776; Koehne in Pflanzenr. 17 (IV. 216): 185. fig. 30, B. 1903; Guppy, Obs. Nat. Pac. 2: 108, 529. 1906; Guillaumin in J. Arnold Arb. 12: 261. 1931; Christophersen in Bishop Mus. Bull. 128: 154. 1935; A. C. Sm. in Sargentia 1: 73. 1942; Yuncker in Bishop Mus. Bull. 178: 88. 1943, in op. cit. 220: 194. 1959; J. W. Parham, Pl. Fiji Isl. 228. 1964, ed. 2. 317. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 110. 1970; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 43. 1972.

FIGURE 50.

Lythrum pemphis Forst. f. Fl. Ins. Austr. Prodr. 36. 1786.

As seen in Fiji, *Pemphis acidula* is an often gnarled or compact tree or shrub 0.3–4 m. high, found in coastal thickets, along rocky coasts, and on limestone cliffs. The branchlets are subangular and densely gray-sericeous when young. The leaves have petioles 0.5–2 mm. long and obovate- to linear-lanceolate blades, these thin-carnose, densely appressed-gray-sericeous on both sides, at length glabrate, and usually 1–3 × 0.5–1 cm. The pedicels are usually 5–10 mm. long, the calyx tube is 12-sulcate, with erect lobes, and the petals are white, elliptic-oblong, somewhat corrugated, and 6–8 × 3–4 mm. The capsule is red, at length turning brown, 0.5–1 cm. in diameter, and with obdeltoid, reddish brown seeds about 3 × 2 mm. Flowers and fruits have been collected between November and February, but a longer fertile season seems probable.

TYPIFICATION: Type material was collected by J. R. & G. Forster (BM LECTOTYPE) on Takaroa, Tuamotu Archipelago, during Cook's second voyage. No locality was given in the original publication, but G. Forster (1786, cited above) stated "Teautea," a locality identified as Takaroa by St. John (in Occas. Pap. Bishop Mus. 18: 80. 1945) in reference to *Rorippa sarmentosa* (Brassicaceae; cf. this *Flora*, vol. 2, p. 710).

DISTRIBUTION: Along coasts of eastern Africa and Indian Ocean islands to southern China and eastward to northern Australia and to easternmost Polynesia. I was in error (1942) in reporting *Pemphis acidula* as not previously recorded from Fiji; in fact Guppy (1906) discussed it as an example of drift plants with seeds that are buoyant for months. Apparently earlier collectors than Guppy overlooked the species in Fiji, and it does seem less common there than in some other Pacific archipelagoes.



LOCAL NAMES: *Sanggali* or *sanggale*; *ngingia* or *ngginggia*.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Near Singatoka, *DA 2664*; Korotongo, east of Singatoka, *O. & I. Degener 32197*. KANDAVU: Nangingia Island (Denham Island), off west point of Kandavu, *DA 14962*. WAKAYA: *Tothill s. n.* KORO: East coast, *Smith 1033*. VANUA LEVU: THAKAUNDROVE: Waina, Maravu, near Salt Lake, *Degener & Ordenez 14165, 14189*. VANUA LEVU and offshore islets, *Guppy*, in 1898 (K). NAYAU: *DA 3166*. FULANGA: On limestone formation, *Smith 1202*. FIJI without further locality, *Tothill 195*.

3. *LAGERSTROEMIA* L. Syst. Nat. ed. 10. 1068, 1076, 1372. 1759, Sp. Pl. ed. 2. 734. 1762; Koehne in Pflanzentr. 17 (IV. 216); 352. 1903; Furtado & Srisuko in Gard. Bull. Singapore 24: 186. 1969.

Unarmed trees or shrubs, the stipules minute; leaves opposite or verticillate, the blades coriaceous to herbaceous, entire; inflorescences terminal or distally axillary and forming leafy panicles, the flowers actinomorphic, (4-)6(-9)-merous; calyx tube (hypanthium) campanulate to infundibular, coriaceous, usually costate or angular, the lobes valvate, ovate, subacute; petals with narrow claws and crispate blades; stamens 15-about 200, 1-several-seriate, inserted below middle of hypanthium, often unequal (1 episepalous and with a thick filament, the others epipetalous, shorter, and with thin filaments), the filaments exerted, the anthers ellipsoid to orbicular; ovary sessile, 3-6(-7)-locular, the placenta axile, the ovules numerous, the style slightly longer than stamens, the stigma inconspicuous; capsule globose or ellipsoid, woody, subadnate proximally to hypanthium, loculicidally 3-6(-7)-valved, the seeds numerous, with a thickened appendage at base, apically produced into a large cultriform wing.

TYPE SPECIES: *Lagerstroemia indica* L., the only original species.

DISTRIBUTION: India and China throughout Malesia to New Guinea and northern Australia, with about 53 species, including various timber trees and ornamentals. Two species are cultivated (one becoming sparingly naturalized) in Fiji. Both may have been introduced by J. B. Thurston, as two species (under incorrect names) of the genus were listed in his 1886 *Catalogue*.

USEFUL TREATMENT OF GENUS: FURTADO, C. X., & M. SRISUKO. A revision of *Lagerstroemia* L. (Lythraeeae). Gard. Bull. Singapore 24: 185-335. 1969.

KEY TO SPECIES

- Leaves subsessile, the blades chartaceous, ovate-oblong to obovate, 5-10 × 3-5 cm.; panicles 5-20 cm. long; hypanthium glabrous, superficially 5- or 6-costate, the ribs often evanescent distally; petals with slender claws 6-10 mm. long and ovate-suborbicular blades 8-12 mm. in diameter; stamens 15-35, the episepalous ones with thick filaments and red anthers, the epipetalous ones with thinner filaments and yellow anthers; capsules about 1 cm. long. 1. *L. indica*
- Leaves with petioles 5-10 mm. long and coriaceous, elliptic-oblong blades usually 10-20 × 5-9 cm.; panicles up to 50 cm. long; hypanthium pilose, 12-14-costate, the ribs obvious; petals with claws 3-6 mm. long and suborbicular blades 20-30 mm. in diameter; stamens about 150 or more, the episepalous and epipetalous ones similar; capsules 2-2.5 cm. long. 2. *L. speciosa*

1. *Lagerstroemia indica* L. Syst. Nat. ed. 10. 1076. 1759, Sp. Pl. ed. 2. 734. 1762; Koehne in Pflanzentr. 17 (IV. 216); 259. fig. 55, A-O. 1903; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 99. 1948; Yuncker in Bishop Mus. Bull. 220: 194. 1959; J. W. Parham, Pl. Fiji Isl. 143. 1964, ed. 2. 317. 1972; Furtado & Srisuko in Gard. Bull. Singapore 24: 190. fig. 1. 1969.

FIGURE 50. *Pemphis acidula*: A, tip of branchlet, foliage, and 2 young flowers, showing bracteoles (b) at base of pedicel, × 4; B, tip of branchlet with foliage and 3 flowers (1 in bud, 1 mature with petals beginning to fall, and 1 past anthesis), × 4; C, inner surface of part of calyx (ovary removed) and stamens, 2 anthers remaining, × 15; D, calyx enclosing mature, dehiscing capsule, × 8. A from *Smith 1202*, B from *O. & I. Degener 32197*, C from *Degener & Ordenez 14189*, D from *Smith 1033*.

Tree or shrub 2–5 m. high, cultivated only near sea level. The petals vary from pink, white, or rich blue to purple, apparently in different cultivated variants. The flowering season in Fiji is from November to March.

TYPIFICATION: Linnaeus based his species on Rumph. Herb. Amb. Auctuar. 7: 61. t. 28. 1755.

DISTRIBUTION: The Himalayas, China, and southeastern Asia, but now widely cultivated and variable as to leaves, flower color, etc., with many cultivars.

LOCAL NAMES AND USE: Known in Fiji as *crepe myrtle* and *Christmas bush*, the species is strikingly ornamental.

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Lami, in private garden, DA 16447, 16458; Suva, in private gardens, DA 16096, 16234, 16780; also growing in the Suva Botanical Gardens (Parham, 1948, cited above), but no vouchers available. In Mathuata Province, Vanua Levu, the species is considered a minor weed in plantations (Parham, 1972, cited above). Numbers 16096 and 16234 are from the garden of the second Sir Maynard Hedstrom, originally J. B. Thurston's "Thornbury."

2. *Lagerstroemia speciosa* (L.) Pers. Syn. Pl. 2: 72. 1807; Koehne in Pflanz. 17 (IV. 216): 261. fig. 55, P–T. 1903; Furtado & Srisuko in Gard. Bull. Singapore 24: 264. fig. 29, A. 1969; J. W. Parham, Pl. Fiji Isl. ed. 2. 317. 1972.

Munchausia speciosa L. in Münchh. Hausvater 5: 357. pl. 2. 1770.

Lagerstroemia flos-reginae Retz. Obs. Bot. 5: 25, p. 1788; J. W. Parham in Agr. J. Dept. Agr. Fiji 29: 33. 1959, Pl. Fiji Isl. 143. 1964.

Tree 7–15 m. high, cultivated near sea level and apparently becoming sparingly naturalized along roadsides and in pastures. The petals are pale pink or nearly white to purple, and flowers occur between November and March; essentially mature fruits were noted in January.

TYPIFICATION AND NOMENCLATURE: *Munchausia speciosa* was based on a plant cultivated in the Botanical Garden at Göttingen, probably originally from Java. Furtado and Srisuko (1969, cited above) consider that Retzius's concept of *Lagerstroemia flos-reginae* included elements of both *L. speciosa* and *L. reginae* Roxb. (1795), although Retzius's description seems principally based on a Javanese plant collected by Bladh.

DISTRIBUTION: Southeastern Asia through Malesia to Celebes and the Philippines; now widely cultivated.

LOCAL NAMES AND USE: In Fiji this beautiful ornamental tree is known as *pride of India* (a misnomer) or simply as *Lagerstroemia*.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Singatoka, Greenwood 774 (coll. H. Phillips). NAITASIRI: "N. T. C." DA 9868; Principal Agricultural Station, Koronivia, DA 12348; vicinity of Navuso, DA 16407. REWA: Suva, along street, DA 12262; in private garden (formerly J. B. Thurston's "Thornbury"), DA 16081; also growing in the Suva Botanical Gardens (Parham, 1959, cited above), but no vouchers available.

4. *LAWSONIA* L. Sp. Pl. 349. 1753; Koehne in Pflanz. 17 (IV. 216): 270. 1903.

Shrub or small tree, glabrous, sometimes with spiny branches, the stipules minute; leaves decussate, short-petiolate; inflorescences terminal and axillary, leafy-paniculate at branchlet apices, the flowers 4-merous, the bracteoles fugacious; calyx broadly turbinate, becoming spreading in fruit, deeply divided into ovate lobes, without alternating appendages; petals minutely clawed, reniform, strongly corrugated; stamens 8, in pairs opposite calyx lobes, rarely 4, 9, or 13, the filaments subulate; ovary sessile, subglobose, 2–4-locular, the placenta axile, the ovules numerous, the style filiform, slightly exceeding stamens, the stigma small; capsule sessile, globose or oblate, indehiscent or irregularly rupturing, the seeds numerous, unwinged, obpyramidal, the testa thickened and spongy apically.

LECTOTYPE SPECIES: *Lawsonia inermis* L. (one of Linnaeus's two original species, now combined, indicated by Britton & Millspaugh, Bahama Fl. 299. 1920).

DISTRIBUTION: Paletropical and monotypic, now widely cultivated.

1. *Lawsonia inermis* L. Sp. Pl. 349. 1753; Koehne in Pflanzenr. 17 (IV. 216): 270. fig. 59. 1903; Safford in Contr. U. S. Nat. Herb. 9: 306. 1905; A. C. Sm. in Sargentia 1: 74. 1942; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 99. 1948, Pl. Fiji Isl. 228. 1964, ed. 2. 317. 1972.

As it is seen in Fiji *Lawsonia inermis* is a tree or shrub 2-6 m. high, occasionally cultivated at or near sea level. The short-petiolate leaves have ovate to elliptic blades usually 2-4 × 1-3 cm. (but sometimes as small as 7 × 4 mm.). The terminal, leafy panicles are up to 20 cm. long, the fragrant flowers about 6 mm. in diameter, the petals white to pale yellow (but red in some cultivars), and the capsules 5-10 mm. in diameter and with seeds about 2-3 mm. long and broad. Flowers are seen between October and March.

TYPIFICATION: Of Linnaeus's several references, that to *Flora Zeylanica* might be considered as indicating an appropriate lectotype.

DISTRIBUTION: Probably indigenous in Asia from western India westward, but early in cultivation so that an original area is uncertain.

LOCAL NAMES AND USES: The *henna* or *mignonette bush* has also been recorded in Fiji under the presumably Hindi names *kiari* and *mendhi*. The species is grown as an ornamental, sometimes in hedges. A pulp prepared from its pounded leaves has been used since ancient times in India and Egypt as a reddish orange dye and cosmetic, and a perfume is prepared from the volatile oil of the flowers. Many parts of the plant have been used medicinally.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Principal Agricultural Station, Koronivia, DA 12347. TAILEVU: Nandali, on Rewa River, DA, Sept. 16, 1937. REWA: Suva, Degener & Ordenez 13627; also growing in the Suva Botanical Gardens in 1948 (Parham, 1948, cited above), but not represented by vouchers, unless these are two sheets of DA (SUVA) without data.

FAMILY 128. MYRTACEAE

MYRTACEAE Juss. Gen. Pl. 322, as *Myrti*. 1789.

Trees or shrubs, stipulate or with vestigial stipules; leaves opposite, disjunct-opposite, whorled, or alternate, petiolate or sessile, the blades simple, entire, often coriaceous, glandular-punctate or with immersed and sometimes inconspicuous glands, usually distinctly pinnate-nerved, often with one or more continuous intramarginal nerves; inflorescences terminal, axillary, or borne on older parts of plant, basically paniculate and frondobracteose but variously complex or reduced and sometimes 1-flowered; flowers actinomorphic, usually ♂, epigynous, sometimes with the hypanthium prolonged beyond ovary, infrequently perigynous, with a well-developed hypanthium partially free from ovary; sepals (3-) 4 or 5 (-6), often imbricate, sometimes closed in bud and irregularly splitting, sometimes completely connate into a caducous calyptra; petals (3-) 4 or 5 (-6), imbricate, sometimes coherent or connivent into a calyptra, sometimes lacking; stamens numerous (rarely few), 1-many-seriate, borne on margin or on adaxial surface of hypanthial rim or on a disk surrounding style, the filaments free or proximally united into phalanges, the anthers bilocular, usually small and versatile, the locules dehiscing longitudinally or rarely by terminal pores, the connective often apically glandular; disk borne on summit of ovary or lining upper surface of hypanthium; ovary usually inferior, (1-) 2-12 (-16)-locular, the ovules 2-many per locule, anatropous or campylotropous, borne on axile placentae, the style often elongate, the stigma capitate but often small; fruits capsular or

baccate (sometimes a drupe or nut), the seeds usually without endosperm, the cotyledons small to large, free or connate, sometimes with interlocking faces, sometimes completely united, the hypocotyl short to elongate.

DISTRIBUTION: Pantropical and subtropical, sometimes warm-temperate, with 100–144 genera; an estimate of 3,000 “or more” species is often given, but this is probably an understatement. The family includes many important timber trees as well as ornamentals. Many species have edible fruits and others produce well-known spices.

LOCAL NAMES AND USES: Many of the Fijian species are important as timber trees, especially in the genera *Syzygium* and *Cleistocalyx*. The local name applied to practically any myrtaceous tree that is used for timber is *yasiyasi*. Consequently this name has little diagnostic value, but in the following text I repeat it as applied to many species. Foresters working in Fiji have found it understandably difficult to differentiate among the various kinds of *yasiyasi*. Collectors for the Department of Forestry have sometimes applied more than one number to the same collection; some of these collections are found in herbaria under the collector's name and number, and in other cases a code number beginning with “S” has been used indicating that a study sample was sent to the C. S. I. R. O. in Australia. Whenever possible, in the Myrtaceae as in other families, I have tied these numbers together by parenthetical citations of alternative numbers.

USEFUL TREATMENTS OF FAMILY: MERRILL, E. D., & L. M. PERRY. The Myrtaceae of China. *J. Arnold Arb.* 19: 191–247. 1938. MERRILL, E. D., & L. M. PERRY. The myrtaceous genus *Syzygium* Gaertner in Borneo. *Mem. Amer. Acad. Arts* 18: 135–202. 1939 (reprinted without change of paging in *Mem. Gray Herb.* 4. 1939). HENDERSON, M. R. The genus *Eugenia* (Myrtaceae) in Malaya. *Gard. Bull. Singapore* 12: 1–293. 1949. MERRILL, E. D. Readjustments in the nomenclature of Philippine *Eugenia* species. *Philipp. J. Sci.* 79: 351–424. 1950. McVAUGH, R. The genera of American Myrtaceae—an interim report. *Taxon* 17: 354–418. 1968. SCHMID, R. A resolution of the *Eugenia*–*Syzygium* controversy (Myrtaceae). *Amer. J. Bot.* 59: 423–436. 1972. SCHMID, R. Floral anatomy of Myrtaceae, I. *Syzygium*. *Bot. Jahrb.* 92: 433–489. 1972. SCHMID, R. Floral anatomy of Myrtaceae, II. *Eugenia*. *J. Arnold Arb.* 53: 336–363. 1972. BRIGGS, B. G., & L. A. S. JOHNSON. Evolution in the Myrtaceae—evidence from inflorescence structure. *Proc. Linn. Soc. New South Wales* 102: 157–256. 1979. SCHMID, R. Comparative anatomy and morphology of *Psiloxylon* and *Heteropyxis*, and the subfamilial and tribal classification of Myrtaceae. *Taxon* 29: 559–595. 1980. ASHTON, P. S. Myrtaceae. In: Dassanayake, M. D., & F. R. Fosberg. *A Revised Handbook to the Flora of Ceylon* 2: 403–472. 1981.

Much of the botanical literature of the past 50 years dealing with the Old World species of Myrtaceae has included discussions of generic concepts, especially as such concepts involve species originally assigned to the genus *Eugenia* L. Cited above is a fraction of this literature, essential to reasonable disposition of the species of subfamily Myrtoideae indigenous in Pacific areas. Opinions vary from that of Henderson (1949), who uses *Eugenia* in the broad, traditional sense summarized by Bentham (in Benth. & Hook. f. *Gen. Pl.* 1: 718 seq. 1865) to that of Briggs and Johnson (1979), whose division of the entire family into 144 genera will seem logical to many present-day taxonomists.

As to *Eugenia* sensu lat. in the Old World, generic groupings in recent years have perhaps been most affected by several papers of Merrill and Perry, some listed above and others listed under individual genera treated below. Their recognition of *Syzygium* Gaertn. for the bulk of the Old World species of this alliance is now widely followed, and in fact its separation from *Eugenia* seems mandatory since the important studies by Schmid (1972 seq.), based largely on floral anatomy. While reaching a firm conclusion as to the suitability of separating *Syzygium* from *Eugenia* sensu lat., Schmid was willing to treat the two resulting genera in a sense that still seems very comprehensive to some taxonomists; Briggs and Johnson have placed the two genera in separate “alliances,” recognizing several segregates from *Syzygium*. Schmid's stud-

ies in particular point to the (presumably more primitive) axile vascular supply to the ovules (in *Syzygium*) as opposed to the (presumably derived) transeptal supply (in *Eugenia*). His meticulous reviews indicate his conclusions to be supported by studies of wood structure, bark anatomy, palynology, pubescence characters, and inflorescence features.

The key to genera occurring in Fiji, below, will indicate my opinion that both *Eugenia* and *Syzygium* are logically further subdivided as to their Old World species, along lines proposed by Merrill and Perry. While the key steps under the subfamily Myrtoideae will seem prolix, they summarize such opinions more concisely than further discussion here could. Additional comments as to generic concepts are added below in text referring to *Syzygium*, *Cleistocalyx*, *Piliocalyx*, and *Jossinia*.

KEY TO GENERA

- Ovary 3-5-locular (occasionally 2- or 6-10-locular); fruits capsular (loculicidally dehiscent in our taxa); leaves alternate or often opposite (to whorled); subfam. Leptospermoideae.
 Inflorescences not spicate (uniflorescences pedunculate); stamens free.
 Sepals separate, persistent; petals present; stamens in 1 or 2 series; leaf blades pinnate-nerved.
 Leaves opposite; inflorescences axillary in pairs below abortive branch apices, the uniflorescences triadic, aggregated or not into confluences with the main axis bracteose; flowers on short anthopodia or lacking them but not connate; ovary locules with axile placentae, the ovules crowded on placental surface; indigenous. 1. *Metrosideros*
 Leaves opposite or whorled (as in our species); inflorescences composed of solitary and axillary capitula (as in our species) or these aggregated, the uniflorescences congested-dichasial; flowers subconnate; ovary locules with basal placentae, the ovules erect; cultivated only.
 2. *Syncarpia*
 Sepals connate into a calycine calyptra (operculum), the hypanthium essentially truncate after dehiscence of calyptra along a fine, transverse line; petals absent (in *Eucalyptus* sensu str.); stamens in several series; ovules in 2-4 rows on axile placentae; leaves usually disjunct-opposite at maturity, the blades often narrow, falcate, and without prominent nervation; uniflorescences usually condensed-dichasial umbellasters; introduced species, cultivated and sometimes becoming naturalized. 3. *Eucalyptus*
 Inflorescences spicate with the main axis often developing into a leafy shoot (uniflorescences monadic or triadic, without a peduncle, the flowers lacking anthopodia, the confluences auxotelic or anauxotelic); cultivated only.
 Stamens usually several-seriate, the filaments free or very shortly united at base; uniflorescences monadic; leaves alternate, the blades often with a prominent costa and submarginal nerves.
 4. *Callistemon*
 Stamens with filaments united into 5 distinct bundles opposite petals, the united portions short and broad to long and linear; uniflorescences monadic or triadic; leaves alternate or opposite, the blades often with 3 or more longitudinal nerves. 5. *Melaleuca*
 Ovary 2-12-locular (occasionally to 16-locular but not in our genera); fruits baccate, fleshy to leathery or pithy; leaves opposite or disjunct-opposite or ternate (to whorled or very rarely alternate but not in our genera); subfam. Myrtoideae.
 Cotyledons small at one end of an elongate, curved, hippocrepiform, or spiralled embryo; calyx in bud composed of distinct sepals or closed but not calyptrate; petals spreading.
 Ovary 2-(rarely-7)-locular; seeds not separated by a false septum.
 Ovules 1-7 per ovary locule, the locules 2, the placentae arising from upper part of dissepiment; fruits with 1-8 seeds, the testa thin; inflorescences many-flowered, cymose-paniculate; hypanthium slightly prolonged above ovary, the sepals free in bud; mature fruits in our species not more than 12 mm. in diameter, blackish; cultivated and sometimes naturalized. 6. *Pimenta*
 Ovules numerous, the locules 2-4 (-7), the placentae axile; fruits with numerous seeds, the testa bony; inflorescences 1- or 3(-7)-flowered.
 Hypanthium prolonged above ovary, the calyx in bud closed or with an apical pore or composed of distinct sepals, usually splitting down to ovary at anthesis; ovary 3- or 4(2-7)-locular, the placentae usually bilamellate; inflorescences 1-flowered or 3(4-7)-flowered dichasial cymes; mature fruits in our species 2 cm. or more in diameter, yellow or red; naturalized species.
 7. *Psidium*
 Hypanthium not produced above ovary, the sepals free and appressed in bud; ovary 2- or 3-locular, the placentae simple; inflorescences 1-flowered; mature fruits in our species not more than 1 cm. in diameter, dark blue; cultivated only. 8. *Myrtus*

Ovary 3-12-locular, the ovules 2 (-4) per locule, collateral; seeds usually 2 per locule of fruit, separated by a false septum, the testa bony; inflorescence 1-many-flowered; hypanthium not produced above ovary, the sepals free in bud; mature fruits in our species not more than 7 mm. in diameter, blackish; indigenous. 9. *Decaspermum*

Cotyledons large, often plano-convex, fleshy, or corneous, much larger than the hypocotyl; calyx in bud composed of distinct sepals or these sometimes fused into a calyptra; petals free or coherent into a calyptra.

Plants mostly glabrous (but trichomes when present multicellular); inflorescences terminal or axillary, largely centrifugal, usually freely branching and many-flowered; inflorescence bracts and bracteoles usually inconspicuous and fugacious (sometimes persistent); flowers 4- or 5-merous; hypanthium often tapering proximally and narrowed into a stipe (pseudostalk, pseudopedicel), the hypanthial rim often considerably prolonged beyond summit of ovary, sometimes only shortly or not so prolonged; calyx sometimes calyptrate (sepals then completely fused and indistinguishable); petals free or coherent into a calyptra; stamens strongly inflexed in bud, usually free (in a few species with filaments proximally united into phalanges); major vascular bundles of hypanthium usually zonocyclic, if monocyclic then with more than 8 major bundles; vascular supply to ovules axile (i. e. through center of gynoecium via bases of septa); dried fruits not easily broken; testa somewhat rough, loosely adherent to pericarp and separating from cotyledons; cotyledons of embryo distinct, usually attached near middle of opposing faces and concealing hypocotyl (but sometimes interlocking and sometimes enclosing intrusive, branched placental tissue and with the hypocotyl essentially external).

Sepals free, persistent or deciduous, but if deciduous then with at least occasional portions remaining on outer margin of hypanthial rim; petals free or coherent into a calyptra; cotyledons of seeds not enclosing branched placental tissue; indigenous, cultivated, and naturalized species.

10. *Syzygium*

Sepals completely fused into an umbonate calyptra and indistinguishable; petals coherent and falling with calycine calyptra; our species indigenous (and endemic).

Calyxine calyptra rounded-conical to rostrate; anthers ellipsoid, the locules parallel; placentation axile, the ovules subsacculating; fruits ellipsoid to subglobose, usually somewhat longer than broad, smooth (terete) to 4-costate; seeds with the cotyledons enclosing the hypocotyl and epicotyl, the opposing faces separated or infrequently interlocking but not enclosing branched placental tissue. 11. *Cleistocalyx*

Calyxine calyptra short-rounded or flattened; anthers broadly oblong, with divergent locules; placentation upper-axile, the ovules dependent from apical angle of ovary locules; fruits subglobose to obovoid-globose, as broad as or broader than long, smooth (terete); seeds with the cotyledons enclosing intrusive and branched placental tissue, the opposing faces ruminate and interlocking, the hypocotyl essentially external. 12. *Piliocalyx*

Plants mostly with some parts pilose, at least sparingly so, the trichomes unicellular; inflorescences predominantly axillary, centripetal, the flowers sometimes solitary or few and fasciculate, sometimes racemose; inflorescence bracts and bracteoles usually conspicuous and persistent, but sometimes caducous at or before anthesis; flowers 4-merous; hypanthium usually rounded or abruptly narrowed proximally and without a stipe, the hypanthial rim not or only slightly prolonged beyond summit of ovary; calyx never calyptrate (sepals always free); petals always free, not coherent; stamens incurved in bud but not sharply so, free; major vascular bundles of hypanthium 8, monocyclic; vascular supply to ovules transeptal (i. e. via peripheries of septa, without vascular tissue in center of ovary below placenta, or such tissue very limited); dried fruits with the pericarp thin and readily crushed; testa smooth, usually free from pericarp and adherent to cotyledons; cotyledons of embryo united (completely fused into a homogeneous, pseudomonocotyledonous embryo or connate).

Flowers borne in opposite and decussate pairs on elongate or much-abbreviated racemes, sometimes seemingly fasciculate in leaf axils, rarely in opposite pairs at nodes below leaves, never solitary in leaf axils, small to medium in size; disk usually comparatively thin; ovary locules with 2-several-many ovules; vascular supply to ovules strictly transeptal; fruits with 1 or 2 seeds, the testa comparatively thin, the cotyledons completely fused into a homogenous embryo; cultivated only. 13. *Eugenia*

Flowers 1-3-fasciculate in leaf axils or sometimes (1-) 2-10-fasciculate below leaves (perhaps in some species borne in racemes), often comparatively large, with buds to 10 x 7 mm., sepals to 10 mm. in diameter, and petals to 20 mm. in diameter; disk broad, thick, cushionlike; ovary locules usually with many (up to 25 or more) ovules; vascular supply to ovules transeptal but also axile in a limited sense, with a few bundles entering via bases of septa; fruits with (1-) 2-6 (or more?) seeds, the testa usually thick or subligneous but sometimes membranaceous or chartaceous, the cotyledons connate (but separate, although said to be sometimes partially or completely fused); our species indigenous, usually littoral, rarely found far inland. 14. *Jossinia*

1. *METROSIDEROS* Banks ex Gaertn. Fruct. Sem. Pl. 1: 170. 1788; Seem. Fl. Vit. 83. 1866; Dawson in *Blumea* 18: 441. 1970; A. C. Sm. in Amer. J. Bot. 60: 479. 1973; Dawson in *Blumea* 23: 7. 1976. Nom. cons.

Trees or shrubs, the branching sympodial in adult plants, the buds with several to many pairs of caducous scales; leaves opposite, petiolate, the blades pinnate-nerved; inflorescences axillary in pairs below abortive branch apices, the uniflorescences triadic, pedunculate, aggregated or not into conflorescences with the main axis bracteose; flowers on short anthopodia or lacking them, usually 5-merous, the hypanthium extending beyond top of ovary; sepals equal, imbricate or not; petals oblong to suborbicular, rounded, often ciliolate, often caducous; stamens 3 or more times as many as petals, borne in a single series, the filaments slender, the anthers dorsifixed, versatile, longitudinally dehiscent, with oil glands in the connective; ovary semi-inferior to nearly superior, usually 3-locular, the placentae axile, the ovules numerous, linear, crowded on placental surface, the style as long as or slightly longer than stamens; mature fruits coriaceous, with free part of capsule extended well beyond to slightly below level of hypanthial rim, the base of style and placentae becoming widely separated by extension of intervening tissue; seeds linear, much longer than broad, sometimes winged, the fertile ones fewer than sterile ones, the embryo straight, the cotyledons adaxially appressed.

TYPE SPECIES: *Metrosideros spectabilis* Solander ex Gaertn., typ. cons. This binomial is referable to *M. collina* (J. R. & G. Forst.) A. Gray var. *villosa* (L. f.) A. Gray (vide A. C. Smith, 1973, pp. 482, 484).

ING (1979) lists as the conserved type species *Metrosideros perforata* (J. R. & G. Forst.) A. Rich. (*Leptospermum perforatum* J. R. & G. Forst.; *M. scandens* Solander ex Gaertn.); this had been listed as the conserved type species in ICBN (1966, Edinburgh edition), a listing altered in the 1972 and 1978 editions and requiring correction in ING.

DISTRIBUTION: New Zealand, Lord Howe Island, New Caledonia, the Solomons, and the Bonin Islands eastward to the Tuamotus and Hawaii, with 25-30 species. Two species are indigenous in Fiji.

USEFUL TREATMENTS OF GENUS: DAWSON, J. W. Pacific capsular Myrtaceae 2. The *Metrosideros* complex: *M. collina* group. *Blumea* 18: 441-445. 1970. SMITH, A. C. Studies of Pacific Island plants. XXVI. *Metrosideros collina* (Myrtaceae) and its relatives in the southern Pacific. Amer. J. Bot. 60: 479-490. 1973. DAWSON, J. W. Pacific capsular Myrtaceae XI. Redefinition of *Metrosideros* Banks ex Gaertn. and definition of infrageneric categories. *Blumea* 23: 7-11. 1976.

The above generic description is modified from Dawson's (1976) to include only his subgenus *Metrosideros*, as suggested by Briggs and Johnson (1979); in his 1976 concept of the genus Dawson included *Mearnsia* and several other (some unnamed) genera segregated by Briggs and Johnson.

KEY TO SPECIES

- Inflorescences compound, the axis of conflorescence 3-30 mm. long and bearing 3-5 decussate pairs of 3-flowered uniflorescences; sepals not (or scarcely in bud) imbricate, 1.5-2 × 1.5-3 mm.; petals 2.5-4 mm. long and broad, dull orange or salmon-pink to yellow; filaments and style bright red or bright orange to yellow; leaves with petioles rarely less than 4 mm. long, the blades rarely less than 4 × 1.5 cm. and usually considerably larger, attenuate to obtuse at base, with prominulous venation on both surfaces, the lowermost secondary nerves not more conspicuous than the others; indument none to sericeous or conspicuously villose. 1. *M. collina*
- Inflorescences simple, each composed of a short-pedunculate, 3-flowered uniflorescence; sepals imbricate, comparatively large, 2-2.5 × 3-4 mm.; petals obovate-suborbicular, to 4 × 4 mm., pale yellow; filaments and style pale yellow; leaves subsessile (petioles 1-2 mm. long), the blades not exceeding 3.5 × 1.7 cm., rounded or broadly obtuse at base, with venation immersed on upper surface, the 2 lowermost pairs of secondary nerves slightly more conspicuous than the others; indument sericeous, very sparse.

2. *M. ochrantha*

1. *Metrosideros collina* (J. R. & G. Forst.) A. Gray, Bot. U. S. Expl. Exped. 1: 558. 1854; A. C. Sm. in Amer. J. Bot. 60: 480. 1973.

As seen in Fiji this complex species consists of trees or shrubs 1–20 m. high, variable as to the indument of vegetative and inflorescence parts, the branchlets subterete to subquadrangular; petioles (2–) 4–12 mm. long; leaf blades often coriaceous and copiously glandular-punctate, elliptic-lanceolate to oblong- or obovate-elliptic, (2.5–) 4–8.5 × (0.8–) 1.5–6 cm.; cymes with 3–5 pairs of uniflorescences with peduncles 3–20 mm. long, the flower-enclosing scales about 6, to 6 mm. long and broad; flowers sessile or with anthopodium to 4 mm. (at anthesis) or 6 mm. (in fruit) long, the lateral flowers subtended by suborbicular bracts to 4 mm. long, the bracteoles to 2 mm. long; hypanthium cupuliform-obconical, 1.5–3 mm. long, 2–4 mm. in distal diameter, extending 1–2 mm. beyond ovary, the sepals 5 (or 6), to 2 × 3 mm.; petals 5 (or 6), obovate to suborbicular, to 4 mm. long and broad; stamens 20–24 (–30), the filaments at anthesis 12–20 mm. long; style 13–30 mm. long; hypanthium in fruit subrotate, 5–7 mm. in diameter at rim, the free part of capsule triquetrous-subglobose, (3–) 5–8 mm. in diameter, conspicuously extending beyond level of hypanthial rim. Flowers and fruits are conspicuous throughout the year.

DISTRIBUTION: New Hebrides eastward to the Marquesas and Tuamotu Islands, and probably also in Hawaii. Differing opinions as to the nomenclature of Hawaiian species were briefly discussed by me in 1973 (p. 481). The preceding description briefly summarizes the salient characters of *Metrosideros collina* in a reasonably inclusive sense. Without reaching a conclusion as to Hawaiian, Marquesan, and easternmost Tuamotuan elements, in 1973 I placed the available material from between the New Hebrides and the Society and Austral Islands in three varieties, a solution originally proposed by Gray. However, *M. collina* var. *temehaniensis* J. W. Moore, from Raiatea, has simple inflorescences and probably should not be included in var. *villosa* (A. C. Sm., 1973, p. 483); it may merit specific rank. The synonyms and typifications indicated below refer primarily to the Fijian Region and are abstracted from my 1973 treatment.

LOCAL NAME AND USES: To the species as a whole the Fijian name *vunga* is firmly attached. The wood of any variety may be used for timber, the trunks of sufficiently large trees being esteemed as houseposts. The highly ornamental flowers are occasionally utilized for decoration and adornment.

KEY TO VARIETIES

Peduncles and hypanthium copiously villose (or subsericeous) with hairs 0.3–1 mm. long, tardily glabrate in fruit; filaments and style usually bright red or scarlet, occasionally orange; ovary at anthesis copiously villose with hairs 0.2–0.7 mm. long; young parts and bud scales copiously villose, the indument composed of hairs 0.5–1 mm. long, briefly persisting on branchlets and leaves; branchlets comparatively stout, 1.5–4 mm. in diameter distally; leaf blades variable in shape, sometimes to 6 cm. broad.

1a. var. *villosa*

Peduncles and hypanthium sericeous with closely appressed hairs 0.1–0.4 mm. long, some indument often persisting in fruit; filaments and style orange-pink to yellow, less commonly red; ovary at anthesis sparsely or copiously tomentose-sericeous with hairs 0.1–0.2 mm. long; young parts and bud scales copiously sericeous, the indument composed of hairs 0.1–0.5 mm. long, evanescent; branchlets comparatively slender, 1–2 mm. in diameter distally; leaf blades prevailing elliptic-lanceolate or narrowly elliptic, rarely more than 3 cm. broad.

1b. var. *collina*

Peduncles and hypanthium glabrous or very sparsely pilose and soon glabrescent; filaments and style usually yellow, less commonly red; ovary at anthesis glabrous or very sparsely tomentose-sericeous with hairs 0.1–0.2 mm. long; young parts and bud scales puberulent-sericeous, the indument composed of hairs 0.1–0.2 mm. long, evanescent; branchlets comparatively slender, 1–2 mm. in diameter distally; leaf blades prevailing elliptic-lanceolate or obovate-elliptic, rarely more than 3.5 cm. broad.

1c. var. *fruticosa*

1a. *Metrosideros collina* var. *villosa* (L. f.) A. Gray, Bot. U. S. Expl. Exped. 1: 558. 1854; J. W. Parham, Pl. Fiji Isl. ed. 2. 197. 1972; A. C. Sm. in Amer. J. Bot. 60: 484. fig. 1-5, 19-24. 1973.

Melaleuca villosa L. f. Suppl. Pl. 342, 1782.

Metrosideros villosa Sm. in Trans. Linn. Soc. 3: 268. 1797; Guillaumin in J. Arnold Arb. 12: 253. 1931.

(?) *Metrosideros villosa* var. *glaberrima* Bertero ex Guillemin in Ann. Sci. Nat. Bot. II. 7: 351. 1837 (repr. Zephyr. Tait. 57. 1838).

(?) *Metrosideros collina* var. *glaberrima* A. Gray, Bot. U. S. Expl. Exped. 1: 558. 1854, in Proc. Amer. Acad. Arts 5: 317, p. p. 1862, in Bonplandia 10: 35, p. p. 1862.

Metrosideros collina var. *vitiensis* sensu A. Gray in Bonplandia 9: 256, p. p. 1861; non A. Gray (1854).

Metrosideros collina sensu Seem. Viti, 436, p. p. 1862; Rolfe in Bot. Mag. 146: t. 8846. 1920; Setchell in Univ. Calif. Publ. Bot. 12: 198. 1926; Yuncker in Bishop Mus. Bull. 220: 205. 1959.

Metrosideros polymorpha sensu Seem. Fl. Vit. 83, p. p. 1866, op. cit. 427, p. p. 1873; non Gaud.

Metrosideros collina "Form 2" Christophersen in Bishop Mus. Bull. 128: 159. 1935, in op. cit. 154: 27. 1938.

As seen in Fiji, *Metrosideros collina* var. *villosa* is usually a tree to about 18 m. high, less frequently a compact shrub as small as 1 m. high, occurring at elevations from near sea level to 1,200 m. in forest and open swamps, on open hillsides, and in the thickets of crests and ridges. An indument of comparatively long, whitish, spreading, and sometimes loosely tangled hairs is characteristic of the variety. The petals are often orange-pink but vary from dull orange to yellow; the filaments and styles are bright red to bright orange (but apparently not yellow).

TYPIFICATION AND NOMENCLATURE: The type of *Melaleuca villosa* is J. R. & G. Forster (UPS OF LINN HOLOTYPE; ISOTYPES at BM, K; cf. my 1973 treatment, p. 482), from Tahiti. *Metrosideros villosa* var. *glaberrima* is typified by a Bertero collection from Tahiti, which I have not seen but which was described as having villose peduncles; I believe that the specimen therefore falls into var. *villosa*, bringing with it Gray's trinomial *M. collina* var. *glaberrima*, even though Gray doubtless intended his varietal combination to represent the essentially glabrous phase of the species (cf. my 1973 treatment, pp. 483, 484). The Seemann collections cited by Gray as this variety in 1862 represent all three varieties.

DISTRIBUTION: New Hebrides to the Austral and Society Islands, and probably also in the Marquesas. In Fiji this variety is especially frequent in southern Viti Levu, but it also occurs in scattered localities eastward into the Lau Group. About 50 Fijian collections are available.

LOCAL NAMES: In addition to the general name *vunga*, this variety has been recorded as *sekula* in the Yasawas.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Nangua, *St. John 18156*. VITI LEVU: MBA: Slopes of Mt. Nairoso, eastern flank of Mt. Evans Range, *Smith 4414*; Nandarivatu, *Tothill 160A* (coll. *W. Teulon*). NANDRONGA & NAVOSA: Nausori Highlands, *DA 13397*. SERUA: Namboutini, *DF 1102 (S1556/5)*, p. p. NAMOSI: Korombasambasanga Range, *DA 2189*; Mt. Voma, *DA 599*. NAITASIRE: Waimanu River, *DA L. 13281 (Berry 70)*. REWA: Mt. Korombamba, *DA 17372*; vicinity of Lami, *H. B. R. Parham 22*; vicinity of Suva, *Tothill 160C*. KANDAVU: Hills above Namalata and Ngaloa Bays, *Smith 67*; Naikorokoro, *DA 11932 (DF 12)*. OVALAU: Summit of Mt. Ndelaiovalau and adjacent ridge, *Smith 7587*. VANUA LEVU: MBUA: Koromba Forest, Wairiki, *DA 15140*. MATHUATA: Mt. Ndelaikoro, *DA 12820*; Mt. Numbuiloa, east of Lambasa, *Smith 6542*. THAKAUNDROVE: Mt. Mbatini, *Smith 682*. TAVEUNI: Borders of lake east of Somosomo, *Smith 860*. VANUA MBALAVU: Near Lomaloma, *Garnock-Jones 1144*. LAKEMBA: Harvey, p. p. FIJI without definite locality, *Seemann 169*, p. p.

1b. *Metrosideros collina* var. *collina*; A. C. Sm. in Amer. J. Bot. 60: 486. fig. 6-12, 25-28. 1973. FIGURE 90.

Leptospermum collinum J. R. & G. Forst. Char. Gen. Pl. 36. t. 36. fig. m-q. 1775, ed. 2. 72. t. id. 1776.

Metrosideros collina var. *vitiensis* A. Gray, Bot. U. S. Expl. Exped. 1: 559. 1854, Atlas, pl. 68. 1856; Seem. in Bonplandia 9: 256, p. p. 1861; J. W. Parham, Pl. Fiji Isl. ed. 2. 198. 1972.

Metrosideros collina sensu Seem. Viti, 436, p. p. 1862.

Metrosideros collina var. *glaberrima* sensu A. Gray in Proc. Amer. Acad. Arts 5: 317, p. p. 1862, in Bonplandia 10: 35, p. p. 1862; non sensu typi.

Metrosideros polymorpha sensu Seem. Fl. Vit. 83, p. p. 1866, op. cit. 427, p. p. 1873; non Gaud.

Metrosideros collina "Form 1" Christophersen in Bishop Mus. Bull. 128: 159, p. p. 1935.

Metrosideros villosa sensu J. W. Parham, Pl. Fiji Isl. 137, p. p. majore. 1964; non Sm.

The nomenclaturally typical variety is noted in Fiji as a compact or slender tree or shrub 2–20 m. high, found from near sea level upward to about 1,120 m. in sometimes dense forest and in swampy places. It is comparatively infrequent at lower elevations. The variety is distinguished by the closely appressed, comparatively short hairs of its distinctly sericeous, fairly persistent indument. Its flowers have the petals salmon-pink to yellow, the filaments and styles predominantly orange-pink but variable, occasionally yellow or red.

TYPIFICATION AND NOMENCLATURE: Among the five Tahitian specimens of *Metrosideros collina* at BM collected during the Cook voyages, the one most significantly labelled as *Leptospermum collinum* is *J. R. & G. Forster* (BM LECTOTYPE; cf. my 1973 treatment, p. 481); this seems to have been the principal basis of the Forsters' 1775 figures. *Metrosideros collina* var. *vitiensis* is typified by *U. S. Expl. Exped.* (us 47895 and 47896 HOLOTYPE; putative ISOTYPE at GH). The Exploring Expedition material described and illustrated by Gray came from three localities: Ovalau and Vanua Levu (Mathuata and Mbua (Sandalwood) Bay). It is not now possible to establish the localities of the two US specimens cited as composing the holotype, and indeed they may be from two different localities; other Exploring Expedition specimens from Fiji are not necessarily strict isotypes. Gray did not attempt to place the Forsters' concept of the species in any of his three varieties, but it is obvious that var. *vitiensis* best agrees with the nomenclatural type of the species.

DISTRIBUTION: New Hebrides to the Society Islands; in Fiji this is the most abundant of the three varieties, about 80 collections having been examined. The variety is especially frequent in the northern uplands of Viti Levu and is one of the most abundant trees in the vicinity of Nandarivatu. It is also common in Mathuata Province, Vanua Levu, and is known from scattered localities eastward and southward into Lau.

LOCAL NAMES: In addition to *vunga*, the names *vungandina*, *vunga tangane*, *vunga tawa*, and *vunga leka* have been recorded from Mba Province.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 295*; vicinity of Nandarivatu, *Parks 20656*, *Degener 14495*; Mt. Nanggaranambuluta, east of Nandarivatu, *DA 2335*; valley of Nggalawana Creek, north of the sawmill at Navai, *Smith 5330*. NADRONGA & NAVOSA: Near "Mbeila." *Horne 935*. SERUA: Namboutini, *DF 1102 (S1556/5)*, p. p.; vicinity of Navua, *DA 9173 (McKee 2737)*. NAMOSI: Summit of Mt. Voma, *Gillespie 2785*; summit of Mt. Vakarangasiu, *Gillespie 3282*. RA: Vicinity of Rewasa, near Vaileka, *Degener 15459*. NAITASIRE: Viria, *Parks 20431*; Waimanu River, *Milne 54*. REWA: Queen's Road 6 miles west of Suva, *Vaughan 3461*. KANDAVU: Kiombo, Naikorokoro, *DF 1021 (S1556/3)*, p. p. OVALAU: Vicinity of Levuka, *Gillespie 4470*. VANUA LEVU: MBUA: Navotuvotu, summit of Mt. Seatura, *Smith 1651*. MATHUATA: Wainunu-Ndreketi divide, *Smith 1853*; Korovuli River, *DA L.24155*. THAKAUNDRUVE: Mt. Kasi, *DA 15734*; Mt. Uluingala, Natewa Peninsula, *Smith 1993*. TAVEUNI: Borders of lake east of Somosomo, *Smith 853*. MATUKU: Near summit of highest peak, *Milne 109*. LAKEMBA: *Harvey*, p. p. FIJI without definite locality, *Seemann 169*, p. p.

1c. *Metrosideros collina* var. *fruticosa* J. W. Moore in Bishop Mus. Bull. 226: 24, fig. 17, 18. 1963; A. C. Sm. in Amer. J. Bot. 60: 488, fig. 13–16, 29–31. 1973.

Metrosideros sp. fl. *luteis* Seem. in Bonplandia 9: 256. 1861, Viti, 436. 1862.

Metrosideros sp. fl. *coccineis* Seem. in Bonplandia 9: 256. 1861, Viti, 436. 1862.

Metrosideros collina var. *glaberrima* sensu A. Gray in Proc. Amer. Acad. Arts 5: 317, p. p. 1862, in Bonplandia 10: 35, p. p. 1862; Setchell in Univ. Calif. Publ. Bot. 12: 198. 1926; J. W. Parham, Pl. Fiji Isl. ed. 2. 197. 1972; non sensu typi.

Metrosideros polymorpha sensu Seem. Fl. Vit. 83, p. p. 1866; non Gaud.

Metrosideros villosa sensu Gibbs in J. Linn. Soc. Bot. 39: 146. 1909; Turrill in op. cit. 43: 20. 1915; non Sm.

Metrosideros villosa var. *glaberrima* sensu Guillaumin in J. Arnold Arb. 12: 253. 1931; non Bertero ex Guillemain.

Metrosideros collina "Form 1" Christophersen in Bishop Mus. Bull. 128: 159, p. p. 1935.

Tristania vitiensis A. C. Sm. in Bishop Mus. Bull. 141: 110. fig. 57, h, i. 1936, in J. Arnold Arb. 36: 286. 1955; J. W. Parham, Pl. Fiji Isl. 142. 1964, ed. 2. 204. 1972.

In Fiji *Metrosideros collina* var. *fruticosa* is recorded as a tree 7–15 m. high, occurring in sometimes dense forest at elevations of 50–925 m. Indument is often lacking, or when present the hairs are very short and comparatively evanescent. The petals are yellow, and the filaments and style are also commonly yellow, but sometimes they are red-tinged and occasionally quite red. Flower color in the three varieties is certainly not dependable, but there is a predominance of red in var. *villosa*, of yellow in var. *fruticosa*, and of a mixture, frequently orange, in var. *collina*.

TYPEFIICATION AND NOMENCLATURE: The type of var. *fruticosa* is *St. John 17267* (BISH HOLOTYPE), collected Oct. 5, 1934, on Raiatea, Society Islands. This appears to provide the first unequivocal name at the varietal level for the "glabrous" phase of *Metrosideros collina*, which has more often passed as var. *glaberrima* (discussed under typification of var. *villosa*). *Tristania vitiensis* is typified by *Smith 684* (BISH HOLOTYPE; many ISOTYPES), collected in fruit Nov. 29, 1933, on the summit of Mt. Mbatini, Thakaundrove Province, Vanua Levu. *Tristania* does not occur as far east as Fiji and my novelty was ill-considered, as the collection is now seen to be a small-leaved variant of the "glabrous" variety of *M. collina*.

DISTRIBUTION: New Hebrides to the Society Islands. In Fiji this is the least abundant of the three varieties, now represented by about 35 collections, all but two of them (from Ovalau and Vanua Levu) being from Viti Levu; the variety is common in the vicinity of Nandarivatu, but less so than var. *collina*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 294*; vicinity of Lewa, *DA 14446*; vicinity of Nandarivatu, *Gibbs 545, 879, im Thurn 129*; vicinity of Nandala, *Degener 14425*. NANDRONGA & NAVOSA: Nausori Highlands, *DF 831*. NAMOSI: Navunikambi, on Wainikoroiuva River, *DA L.13280 (Berry 15)*; between Namosi and Vuniwaivutuku, *Seemann 170*; vicinity of Namosi, *Seemann 171, Gillespie 2526*. RA: Vicinity of Rewasa, near Vaileka, *Degener 15458*. NAITASIRI: Waindrandra Creek, *DA 3404*; Tholo-i-suva, *DF 229 (Bola 78)*. TAILEVU: Between Raralevu and Namata, *DA 2672*. OVALAU: Hills west of Lovoni Valley, on ridge south of Mt. Korolevu, *Smith 7626*.

2. *Metrosideros ochrantha* A. C. Sm. in Amer. J. Bot. 60: 490. fig. 18, 36–39. 1973.

Tree to 4 m. high, occurring in dense, low forest at an elevation of 300–430 m. *Metrosideros ochrantha* merits specific separation from the *M. collina* complex as noted in the above key: leaves subsessile, the blades narrowly ovate, gradually narrowed into an acumen 5–8 mm. long; inflorescences simple, short-pedunculate, 3-flowered uniflorescences; sepals comparatively large and imbricate; petals, filaments, and style pale yellow, the filaments 12–14 mm. long, the style 11–13 mm. long; indument of vegetative and inflorescence parts sericeous, sparse, evanescent. Only the type collection is known.

TYPEFIICATION: The type is *Smith 1768* (BISH HOLOTYPE; many ISOTYPES), collected in flower and fruit May 10, 1934, on Mt. Kasi, Yanawai River region, Thakaundrove Province, Vanua Levu.

DISTRIBUTION: Endemic and presumably limited to Mt. Kasi and its vicinity, which (cf. this *Flora*, vol. 2, p. 356) has an unusual and stunted vegetation.

2. *SYNCARPIA* Tenore in Ind. Sem. Hort. Bot. Neap. 1839: 12. 1839, in Ann. Sci. Nat. Bot. II. 13: 381. 1840; P. Ashton in Rev. Handb. Fl. Ceylon 2: 453. 1981.

Trees, with flaky bark; leaves opposite or whorled (as in our species), the blades pinnate-nerved; inflorescences composed of solitary and axillary capitula or these aggregated into seemingly terminal panicles (uniflorescence a pedunculate, congested dichasium, the main axis of confluence frondose), the flowers subconnate in dense, globose heads; hypanthium turbinate or campanulate, the free portion erect or subspreading, the sepals 4, rarely 5, persistent, equal, short; petals 4, rarely 5, small, spreading; stamens many, free, in 1 or 2 sometimes interrupted series, the filaments filiform, the anthers versatile, with latrorse-longitudinal dehiscence; ovary 2- or 3-locular, truncate or convex at apex and scarcely depressed around style, the locules with 1-many ovules erect from basal placentae, the style filiform, the stigma small; fruit capsular, included in and adnate to hypanthium, loculicidally dehiscent in 2 or 3 valves, the seeds linear-cuneate, the testa thin, the embryo straight, the cotyledons plano-convex, exceeding radicle.

TYPE SPECIES: *Syncarpia laurifolia* Tenore = *S. glomulifera* (Sm.) Niedenzu (*Metrosideros glomulifera* Sm.).

DISTRIBUTION: Queensland, Australia, with five species, at least two of which are frequently cultivated elsewhere, one occasionally in Fiji.

1. *Syncarpia glomulifera* (Sm.) Niedenzu in Engl. & Prantl, Nat. Pflanzenfam. III. 7: 88. 1892; J. W. Parham, Pl. Fiji Isl. ed. 2. 199. 1972; P. Ashton in Rev. Handb. Fl. Ceylon 2: 453. 1981.

Metrosideros glomulifera Sm. in Trans. Linn. Soc. 3: 269. 1797.

Syncarpia laurifolia Tenore in Ind. Sem. Hort. Neap. 1839: 12. 1839, in Ann. Sci. Nat. Bot. II. 13: 381. 1840; Benth. Fl. Austral. 3: 265. 1867.

An often slender tree, up to 30 m. high where indigenous, occasionally cultivated at low elevations. The indument of young branchlets, lower surfaces of leaf blades, peduncles, and calyces is copiously pale-tomentose with short, simple hairs, and the leaves are in whorls or pseudowhorls of 4, with coriaceous, elliptic-lanceolate blades usually 5-10 × 2-4 cm. The flowers, with white petals and filaments, are 6-10 (often 7) per head, the peduncles are 2-3 (-5) cm. long, and in fruit the heads become about 2 cm. in diameter. Our collection bore flowers and fruits in August.

TYPIFICATION AND NOMENCLATURE: The type of *Metrosideros glomulifera* was collected by David Burton near Port Jackson, Australia, and is probably in the J. E. Smith Herbarium; that of *Syncarpia laurifolia* was cited by Tenore merely as "Patria Nova Hollandia?" The synonymy of these and other names suggested by Bentham (1867) seems generally accepted.

DISTRIBUTION: Eastern Australia, occurring from the vicinity of Sydney northward.

LOCAL NAMES AND USES: Names applied to the species are *lustre wood* and *turpentine tree*. In Australia the wood is used for building and also for wharfs and fences, and elsewhere the species is used for reforestation. In Fiji *Syncarpia* is probably a comparatively recent introduction by the Department of Forestry as a potential reforestation species.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Tholo-i-suva, DF 1095 (*Damanu* 209), Aug. 16, 1965.

3. *EUCALYPTUS* L'Hér. Sert. Angl. 18. 1789, op. cit. t. 20. 1792; P. Ashton in Rev. Handb. Fl. Ceylon 2: 455. 1981.

Trees (or shrubs), secreting resinous gums, often extremely large, the bark characteristically patched with white to brown colors and exfoliating in strips or flakes, or

scaly, or thick and fibrous, or hard and furrowed, the indument lacking or scattered or clustered; leaves usually disjunct-opposite at maturity, the blades usually coriaceous, variable in shape but often narrow, falcate, and without prominent venation; inflorescences axillary or seemingly terminal and paniculate or subumbellate (actually axillary, the uniflorescences usually condensed-dichasial umbellasters, pedunculate, with primary axes arising from frondose or frondobraceose conflourescence branches), the flowers with or without short anthopodia; hypanthium campanulate to obconical, smooth or costate, essentially truncate after dehiscence of the calycine calyptra (operculum), this short or prolonged, often leathery, opening along a fine, transverse line; petals absent (in *Eucalyptus* sensu str.); stamens numerous, in several series, free, all fertile or the outer ones lacking anthers, the filaments slender, folded in bud, the anthers versatile or subbasifixed, usually with a distal, adaxial gland, dehiscing by latrorse-longitudinal slits or rarely by terminal pores; ovary adnate to hypanthium proximally or completely, flat to conical at apex, 2-7-locular, the ovules numerous, in 2-4 rows on axile placentae, the style subulate or subclavate, the stigma small; fruit dry, capsular, adnate to the enlarged, woody hypanthium, the dehisced valves exerted or concealed by hypanthium, the seeds for the most part abortive, the comparatively few fertile ones ovoid or flattened or irregular and angular, the cotyledons folded over the radicle.

TYPE SPECIES: *Eucalyptus obliqua* L'Hér.

DISTRIBUTION: Indo-Malesia (few species) to Australia, with 600 or more species, of great economic importance for its rapid growth and valuable timber or for commercial oils. Many species are cultivated elsewhere for reforestation, timber, and ornament.

USEFUL TREATMENT OF GENUS: MAIDEN, J. H. A Critical Revision of the Genus *Eucalyptus*. 1-8. 1903-1933.

The vast genus requires a specialist for recognition of species in the field and even in herbaria, and many active botanists have studied it in great detail, building upon the comprehensive work of Maiden cited above. *Eucalyptus* sens. lat. is considered divisible into nine logical genera by Briggs and Johnson (1979, pp. 216-219, and references there cited).

Thirteen species have been recorded as introduced into Fiji, either experimentally or as a part of reforestation projects. The genus being beyond the ability of any but a specializing expert, I here merely list the species under the names used in their Fijian introductions, with available collections, in the sequence of Maiden and with his assigned species numbers.

1. *Eucalyptus deglupta* Bl. Mus. Bot. Lugd.-Bat. 1: 83. 1849; Maiden, Crit. Revis.

Eucalyptus 1: 13. 1903; J. W. Parham, Pl. Fiji Isl. 137. 1964, ed. 2. 197. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 128. 1970.

TYPIFICATION: Blume based the species on a Celebes specimen in leaf only, which he found in Reinwardt's collection.

DISTRIBUTION: Malesia from the southern Philippines to islands east of New Guinea; cultivated elsewhere, in the Pacific at least in Hawaii, Rarotonga, and Niue as well as Fiji.

LOCAL NAMES AND USES: Names noted in Hawaii are *Mindanao gum* and *Bagras eucalyptus*. It was introduced into Fiji by the Department of Forestry as a potential timber tree and it is also grown as an ornamental. It seems well adapted to the climate of Fiji and has become established in lowland wet and dry forest as well as in montane forest to an elevation of about 825 m. Maiden did not assign a number to *Eucalyptus deglupta*.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Ndrasa Forest Reserve, near Lautoka, *DF 479*, p. p., *Damanu D.11*, *Gaunavou 1*; Vatuthere Plantation, Nandarivatu, *DF 1039 (S1560/1)*, *1040 (S1560/2)*. NAMOSI: Nambukavesi Creek area, *DF 434*, p. p. (*Damanu 99*). NAITASIRI: Langgere Forest Nursery and Plantation, Kalambo, *DF 776*, *777*, *1041 (S1560/3)*, *1042 (S1560/4)*, *1043 (S1560/5)*, *1044 (S1560/6)*. *DA 16417*, *Damanu C.1*, *C.2*.

2. *Eucalyptus leptophleba* F. v. Muell. in J. Proc. Linn. Soc. Bot. 3: 86. 1858; Maiden, Crit. Revis. *Eucalyptus 1*: 332 (no. 38). 1908; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 114. 1939.

TYPIFICATION: Maiden notes that the type came from grassland near the Gilbert River.

DISTRIBUTION: Queensland and perhaps also New South Wales.

LOCAL NAME: *Box gum* (recorded by Parham, 1939).

Like several other species here recorded, *Eucalyptus leptophleba* is not represented by Fijian vouchers, being known only from the 1939 list of Parham. He indicates that the species had been introduced in 1938 and was doing well on the property of W. L. Wallace, Tovu Island, Ra Province, Viti Levu.

3. *Eucalyptus crebra* F. v. Muell. in J. Proc. Linn. Soc. Bot. 3: 87. 1858; Maiden, Crit. Revis. *Eucalyptus 2*: 63 (no. 51). 1910; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 114. 1939.

TYPIFICATION: The type was collected between Newcastle Range and Moreton Bay, Queensland.

DISTRIBUTION: Queensland and New South Wales.

LOCAL NAME: *Narrow-leaf iron-bark* (recorded by Parham, 1939).

Not represented by Fijian herbarium vouchers, this species is said to have been introduced in 1924; it is recorded only from Tovu Island, Ra.

4. *Eucalyptus staigeriana* F. v. Muell. ex F. M. Bailey, Syn. Queensl. Fl. 176. 1883; Maiden, Crit. Revis. *Eucalyptus 2*: 69 (no. 52). 1910; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 115. 1939.

TYPIFICATION: The type is *P. F. Sellheim*, Palmer River.

DISTRIBUTION: Limited to northern Queensland, chiefly along the Palmer River.

LOCAL NAME: *Lemon-scented iron-bark* (recorded by Parham, 1939).

In Fiji known only from Tovu Island, Ra, but without herbarium vouchers.

5. *Eucalyptus paniculata* Sm. in Trans. Linn. Soc. 3: 287. 1797; Maiden, Crit. Revis. *Eucalyptus 2*: 104 (no. 61). 1911; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 114. 1939; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 128. 1970.

TYPIFICATION: The type was collected by *David Burton* (BM HOLOTYPE in Banks Herbarium) at Port Jackson.

DISTRIBUTION: New South Wales, but extending into adjacent Victoria and Queensland.

LOCAL NAMES: *Grey iron-bark* (recorded by Parham, 1939); sometimes known elsewhere as *white iron-bark*.

Without herbarium vouchers from Fiji, but said to have been introduced in 1920 and, like the three preceding species, reported from Tovu Island, Ra. *Eucalyptus paniculata* was one of several species introduced in Niue in 1959 and the one that seems best established there (Sykes, 1970).

6. ***Eucalyptus botryoides* × *robusta***; J. W. Parham, Pl. Fiji Isl. ed. 2. 196. 1972.
(*Eucalyptus botryoides* Sm. in Trans. Linn. Soc. 3: 286. 1797; Maiden, Crit. Revis. *Eucalyptus* 3: 50 (no. 126). 1915.)
(*Eucalyptus robusta* Sm. in Shaw & Sm. Zool. Bot. New Holland 1: 39. t. 13. 1793, in Trans. Linn. Soc. 3: 283. 1797; Maiden, Crit. Revis. *Eucalyptus* 3: 45 (no. 125). 1915.)
TYPIFICATION: The two parent species were noted by Maiden (1915) as close allies; no types were listed by him or by the original author.
DISTRIBUTION: *Eucalyptus botryoides* is said to be from eastern and southeastern Australia, *E. robusta* from New South Wales and Queensland.
LOCAL NAME: No name has been recorded in Fiji, but in Hawaii *Eucalyptus robusta* is noted as *swamp mahogany*.
AVAILABLE COLLECTIONS: VITI LEVU: Mba; Ndrasa Forest Reserve, near Lautoka, DA 13729 (DF 422, June 28, 1962), 13863 (DF 421, June 28, 1962).
7. ***Eucalyptus resinifera*** Sm. in White's Voyage. 1790 (reference taken from the following); Maiden, Crit. Revis. *Eucalyptus* 3: 207 (no. 155). 1917; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 115. 1939.
TYPIFICATION: Apparently no type was mentioned by Smith in 1790.
DISTRIBUTION: Eastern districts of New South Wales and Queensland.
LOCAL NAMES: *Stringy bark* and *red mahogany* were listed by Parham (1939).
Not represented by Fijian herbarium vouchers but said to have been introduced in 1918 and recorded only from Tovu Island, Ra.
8. ***Eucalyptus tereticornis*** Sm. in Shaw & Sm. Zool. Bot. New Holland 1: 41. 1793, in Trans. Linn. Soc. 3: 284. 1797; Maiden, Crit. Revis. *Eucalyptus* 4: 1 (no. 158). 1917; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 115. 1939; J. W. Parham, Pl. Fiji Isl. ed. 2. 197. 1972.
TYPIFICATION: The type was from Sydney, New South Wales.
DISTRIBUTION: Victoria, New South Wales, and Queensland; also in New Guinea.
LOCAL NAMES: *Red iron-bark* (recorded by B. E. V. Parham, 1939); elsewhere the names *red iron-gum* and *forest red gum* have been noted.
AVAILABLE COLLECTIONS: VITI LEVU: Mba; Namosau Government Station, Mba, DA 13782 (DF 160), S. *Henfiro* 1 (May 22, 1961).
The species is an important and widespread timber tree in Australia; B. E. V. Parham (1939) indicates that it was introduced into Fiji in 1924 and has been established on Tovu Island, Ra.
9. ***Eucalyptus torelliana*** F. v. Muell. Fragm. Phyt. Austral. 10: 106. 1877; Maiden, Crit. Revis. *Eucalyptus* 4: 239 (no. 204). 1920; J. W. Parham, Pl. Fiji Isl. ed. 2. 197. 1972.
TYPIFICATION: The type is *Fitzalan*, obtained near Trinity Bay.
DISTRIBUTION: Northern Queensland.
LOCAL NAME: No name has been recorded in Fiji, but in Queensland this timber tree is known as *cadaga*.
AVAILABLE COLLECTIONS: VITI LEVU: Mba; Ndrasa Forest Reserve, near Lautoka, DF 479, p. p. SERUA: Vicinity of Namboutini, DA 13829 (DF 181). NAMOSI: Nambukavesi Creek area, DF 434, p. p. (*Damanu* 99).

10. **Eucalyptus corymbosa** Sm. in Shaw & Sm. Zool. Bot. New Holland 1: 43. 1793, in Trans. Linn. Soc. 3: 287. 1797; Maiden, Crit. Revis. Eucalyptus 4: 242 (no. 205). 1920; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 114. 1939.
 TYPIFICATION: The type was from Sydney, New South Wales.
 DISTRIBUTION: New South Wales and Queensland.
 LOCAL NAME: The name *bloodwood* was listed by Parham (1939).
 In Fiji listed only from Tovu Island, Ra, but without herbarium vouchers.
11. **Eucalyptus calophylla** R. Br. in J. Geogr. Soc. 1: 20. 1832; Maiden, Crit. Revis. Eucalyptus 5: 73 (no. 237). 1920; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 114. 1939.
 TYPIFICATION: The type is *Fraser*, from King George's Sound, near Cape Leeuwin, Western Australia.
 DISTRIBUTION: Western Australia.
 LOCAL NAME: *Red gum* (recorded by Parham, 1939).
 Known in Fiji only from Tovu Island, Ra, but without herbarium vouchers.
12. **Eucalyptus maculata** Hook. in Hook. Icon. Pl. 7: t. 619. 1844; Maiden, Crit. Revis. Eucalyptus 5: 84 (no. 239). 1920; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 114. 1939.
 TYPIFICATION: The type is *Backhouse 37*, from Maitland District, New South Wales.
 DISTRIBUTION: New South Wales and Queensland.
 LOCAL NAME: *Spotted gum* (recorded by Parham, 1939).
 Not represented by Fijian herbarium vouchers, but reported as introduced in 1918 and established on Tovu Island, Ra.
13. **Eucalyptus citriodora** Hook. in Mitchell, Trop. Australia, 235. 1848; Maiden, Crit. Revis. Eucalyptus 6: 433 (no. 346). 1923; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 114. 1939; J. W. Parham, Pl. Fiji Isl. 137. 1964, ed. 2. 197. 1972.
 TYPIFICATION: The type was collected by Mitchell in Queensland.
 DISTRIBUTION: Limited to Queensland.
 LOCAL NAME: *Lemon-scented gum*.
 AVAILABLE COLLECTIONS: VITI LEVU: MBA: Ndrasa (or Tawakumbu) Forest Reserve, near Lautoka, DF 623, 624, 625, D/1 (S1405/1), D/2 (S1405/2), T/1 (S1405/3), T/2 (S1405/4), T/3 (S1405/5).
 B. E. V. Parham (1939) noted that the species was introduced in 1917 and was established on Tovu Island, Ra.

4. **CALLISTEMON** R. Br. in Flinders, Voy. Terra Australis 2: 547. 1814.

Large shrubs or small trees; leaves alternate (disperse), the blades coriaceous, terete to lanceolate, often with a prominent costa and submarginal nerves; inflorescences spicate with the axis soon developing into a leafy shoot (uniflorescences monadic, the solitary flower borne on bracteate or sometimes frondose, auxotelic conflorescences), the flowers slightly immersed in the woody rachis, the subtending bracts none or sometimes foliaceous and usually caducous; hypanthium campanulate to urceolate, the free portion erect or contracted, the sepals 5, imbricate, subscarious, deciduous; petals 5, suborbicular, spreading, longer than sepals; stamens conspicuous, numerous, usually several-seriate, the filaments free or very shortly united at base, the anthers versatile, longitudinally dehiscent; ovary villose and usually convex at apex, slightly depressed around style, 3- or 4-locular, the ovules numerous, horizontal or ascending,

the style filiform, the stigma small; fruiting hypanthium coriaceous and accrescent, the capsule enclosed within and adnate to it, loculicidally dehiscent at apex, the seeds linear to cuneate, with a thin testa and plano-convex cotyledons longer than the radicle.

TYPE SPECIES: *Callistemon rigidus* R. Br. Although ING (1979) lists this as *C. rigidum*, modern compounds ending in *-stemon* should be masculine (ICBN, Rec. 75A.2).

DISTRIBUTION: Australia and New Caledonia, with about 25 species, several of which are cultivated elsewhere, as is one in Fiji.

1. *Callistemon citrinus* (Curtis) Skeels in U. S. Dept. Agr. Pl. Industr. Bull. **282**: 49. 1913; Stapf in Bot. Mag. **150**: sub *t.* 9050. 1925; J. W. Parham, Pl. Fiji Isl. ed. 2. 195. 1972.

Metrosideros citrina Curtis in Bot. Mag. **8**: *t.* 260. 1794.

Metrosideros lanceolata Sm. in Trans. Linn. Soc. **3**: 272, nom. illeg. 1797.

Callistemon lanceolatus DC. Prodr. **3**: 223, as *C. lanceolatum*, nom. illeg. 1828; Benth. Fl. Austral. **3**: 120. 1867.

A shrub or tree to 10 m. high, occasionally cultivated near sea level. The young vegetative parts, rachises, and hypanthium are copiously white-pilose but soon glabrate; the leaf blades are lanceolate, usually 4–7 × 0.5–1 cm., pinnate-nerved. The many-flowered inflorescences are 5–10 cm. long, the hypanthium at anthesis 2–3 mm. long and in fruit 4–6 mm. long; the petals are greenish or reddish, 3–6 mm. in diameter, and the red filaments are 1.5–2.5 mm. long. Our material bore flowers in November.

TYPIFICATION AND NOMENCLATURE: *Metrosideros citrina* was described from a cultivated plant originally introduced from Botany Bay, Australia. In 1797 Smith deliberately renamed the species because he considered its epithet "too preposterous to be retained."

DISTRIBUTION: Eastern Australia, now widely cultivated.

LOCAL NAME AND USE: *Bottlebrush* is the essentially generic name used in Australia; the species is a desirable ornamental.

AVAILABLE COLLECTION: VITI LEVU: NANDRONGA & NAVOSA: Singatoka, DA 9634 (L.4009).

5. MELALEUCA L. Syst. Nat. ed. 12. 509. 1767, Mant. Pl. 14, 105. 1767. Nom. cons.

Shrubs or trees, the leaves alternate (disperse) or opposite, the blades usually coriaceous, often with 3 or more longitudinal nerves; inflorescences spicate (sometimes with additional distal spikes) or subcapitulate, with scattered or congested flowers, the axis usually developing into a leafy shoot (uniflorescences as in *Callistemon* but often triadic, the conflorescences sometimes anauxotelic); flowers as in *Callistemon* but with filaments united into 5 distinct bundles opposite petals, the united portions (claws) short and broad to long and linear; ovary 3-locular.

TYPE SPECIES: *Melaleuca leucadendra* (L.) L. (*Myrtus leucadendra* L.), typ. cons. Blake (1968, cited below) used the spelling *leucadendron* because Linnaeus was not consistent in his spelling but always used an initial capital for the epithet, suggesting that he intended it to be a noun used in apposition. The spelling *leucadendron* was listed in ICBN (editions of 1952, 1956, and 1961) but was changed to *leucadendra* in the 1966, 1972, and 1978 editions; the latter spelling should now be adopted.

DISTRIBUTION: Australia, with about 100 species, a few of which extend into Malaysia and to New Caledonia. Some species have useful timber, and a medicinal oil is distilled from the leaves of at least one species. Several species are widely utilized ornamentally and for reforestation. Two species are cultivated in Fiji.

USEFUL TREATMENT OF (part of) GENUS: BLAKE, S. T. A revision of *Melaleuca leucadendron* and its allies (Myrtaceae). Contr. Queensland Herb. 1: 1-114. 1968.

KEY TO SPECIES

- Leaves usually alternate, with petioles 4-10 mm. long, the blades lanceolate, usually 5-9 × 1-2 cm. (commonly 4-7 times longer than broad) and 5(3-7)-nerved; uniflorescences mostly triadic, not opposite; stamens 6-9 per bundle, the claws short, 1.5-2 mm. long, the free parts of filaments 10-18 mm. long. 1. *M. quinquenervia*
- Leaves usually opposite, with petioles 1-2 mm. long, the blades linear to linear-lanceolate, usually 1.5-4 cm. × 1-2 mm. and faintly 1-nerved; uniflorescences monadic, opposite in pairs; stamens numerous in bundles, the claws slender, conspicuous, to 15 mm. long, the free parts of filaments 3-5 mm. long. 2. *M. linariifolia*

1. ***Melaleuca quinquenervia*** (Cav.) S. T. Blake in Proc. Roy. Soc. Queensland 69: 76. 1958, in Contr. Queensland Herb. 1: 28. fig. 3, 14C, 15C. 1968.

Metrosideros quinquenervia Cav. Icon. Descr. Pl. 4: 19. pl. 333. 1797.

Melaleuca leucadendron sensu B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 115. 1939; non L.

Melaleuca leucadendra sensu J. W. Parham, Pl. Fiji Isl. ed. 2. 197. 1972; non L.

A tree attaining a height of 25 m. where indigenous, occasionally cultivated at low elevations. The trunk characteristically has exfoliating layers of whitish or brownish bark; the spicate inflorescences are usually 3-8 cm. long at anthesis and (including the spreading filaments) 2.5-3.5 cm. in diameter; the flowers usually have white petals and filaments, and the hypanthium, 2-2.5 mm. long and broad at anthesis, becomes 4-5 mm. in diameter in fruit. The cited collection bore flowers and fruits in December.

TYPIFICATION: The type is *Née* (MA HOLOTYPE apparently lost), collected in April, 1793, at Port Jackson, Australia; the figure of Cavanilles may serve as the lectotype. Blake (1968) discusses many names considered synonymous.

DISTRIBUTION: Australia (Queensland and New South Wales), New Guinea, and New Caledonia; widely cultivated elsewhere. The species commonly used for reforestation and ornament in Hawaii and in many other tropical and subtropical areas, often referred to *M. leucadendra* (L.) L., is actually *M. quinquenervia*. Blake's discussion and illustrations of these and of *M. cajuputi* Powell (1968, pp. 14-35. fig. 1-3, 15A-C) leave no doubt of their identities.

LOCAL NAME AND USES: *Paper bark* is the usual Australian name for several species of the *Melaleuca leucadendra* alliance. Although *cajuput* or *cajuput* is sometimes applied to this species in Hawaii and elsewhere, that vernacular name should be reserved for *M. cajuputi* Powell, the source of cajuput oil, based on one of the Rumphian elements often taken to typify *M. leucadendra* (for a clarification of the correct typification of these two species, cf. Blake, 1968, pp. 21, 22). *Melaleuca quinquenervia* was introduced into Fiji in 1920 and was reported by B. E. V. Parham (1939, cited above), to be growing well on the property of W. L. Wallace, Tovu Island, Ra Province, Viti Levu. It may now be grown experimentally for reforestation as well as occasionally for ornament.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Tholo-i-suva, Department of Forestry compound, DA 11562.

2. ***Melaleuca linariifolia*** Sm. in Trans. Linn. Soc. 3: 278. 1797, Exot. Bot. 1: 109. t. 56, as *M. linariifolia*. 1805; Benth. Fl. Austral. 3: 140. 1867; J. W. Parham, Pl. Fiji Isl. ed. 2. 197. 1972.

A tree, becoming tall where indigenous, occasionally cultivated near sea level, with soon glabrate foliage and inflorescences. The flowers (monadic uniflorescences) are opposite in pairs and are well spaced on inflorescences 2.5-7 cm. long; the hypanthium is 2-3 mm. long at anthesis and only slightly larger in fruit; and the petals and filaments are usually white. The cited collection was in flower in November.

TYPIFICATION: The type was listed as *White* (LINN HOLOTYPE, in J. E. Smith Herbarium), from Port Jackson, Australia.

DISTRIBUTION: New South Wales and Queensland, cultivated elsewhere.

USE: The species is an attractive ornamental.

AVAILABLE COLLECTION: VITI LEVU: NANDRONGA & NAVOSA: Singatoka, DA 9635 (L.4001).

6. *PIMENTA* Lindl. Collect. Bot. t. 19. 1821.

Aromatic trees or shrubs, sometimes functionally dioecious but with ♂ flowers; leaves opposite, the blades coriaceous, conspicuously glandular-punctate beneath, pinnate-nerved, obtuse to rounded or submarginate at apex; inflorescences axillary or seeming terminal and cymose-paniculate, many-flowered (uniflorescences paniculate or metabotryoidal, pedunculate, the conflourescence unspecialized, its main axis frondose, auxotelic), the flowers small, without anthopodia; hypanthium slightly prolonged above ovary, the sepals 4 or 5, spreading, persistent; petals 4 or 5, suborbicular, spreading, white, soon deciduous; stamens numerous, free; ovary 2-locular, the ovules 1 or 4-7 per locule, borne on placenta arising from upper part of dissepiment, the stigma peltate-convex, thicker than style; fruit baccate, ovoid to obovoid or subglobose, 1- or 2-locular, the seeds 1-8, the testa thin, the cotyledons small and inconspicuous at one end of an elongate, curved or spiralled embryo.

TYPE SPECIES: *Pimenta officinalis* Lindl. = *P. dioica* (L.) Merr.

DISTRIBUTION: A small tropical American genus, variously interpreted as including 5-18 species but possibly comprising only two very distinct and variable species (McVaugh in Taxon 17: 406. 1968); these may originally have been West Indian, but early they became naturalized in Central and northern South America and subsequently were cultivated in other tropical areas. The two species are recorded from Fiji, but no attempt is here made to suggest infraspecific taxa.

KEY TO SPECIES

Sepals and petals 4; ovule 1 per ovary locule; seeds (1 or) 2, with the embryo spiralled; petioles usually 10-15 mm. long; leaf blades commonly 2 1/4-3 1/4 times longer than broad and plane at margin.

1. *P. dioica*

Sepals and petals 5; ovules 4-7 per ovary locule; seeds 2-8, with the embryo curved; petioles usually 5-10 mm. long; leaf blades commonly 1 1/2-2 (-2 1/4) times longer than broad and recurved or revolute at margin. 2. *P. racemosa*

1. *Pimenta dioica* (L.) Merr. in Contr. Gray Herb. 165: 37. fig. 1. 1947; Purseglove, Trop. Crops, Dicot. 409. fig. 65. 1968.

Myrtus pimenta L. Sp. Pl. 472. 1753.

Myrtus dioica L. Syst. Nat. ed. 10: 1056. 1759, Sp. Pl. ed. 2. 675. 1762.

Pimenta officinalis Lindl. Collect. Bot. sub. t. 19. 1821; J. W. Parham in Agr. J. Dept. Agr. Fiji 29: 33. 1959, Pl. Fiji Isl. 137. 1964, ed. 2. 198. 1972; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 101. 1972.

A tree 6-10 m. high or more where indigenous, sparingly cultivated near sea level. The leaves have petioles 1-1.5 cm. long and elliptic to elliptic-oblong blades 6-15 × 3-6 cm.; the flowers are 8-10 mm. in diameter at anthesis, and the fruits are dark purple when mature, 5-7 mm. in diameter.

TYPIFICATION AND NOMENCLATURE: A discussion of the many synonyms referable to *Pimenta dioica* is provided by Merrill (1947, cited above, pp. 30-38). The earliest binomial, *Myrtus pimenta*, was apparently based on pre-Linnaean references, no specimen of it being available in the Linnaean Herbarium. *Pimenta officinalis* was by inference based on this and was the name commonly used for the allspice tree prior to 1947. *Myrtus dioica* (LINN 637.11 HOLOTYPE) was based on two branchlets presumably sent from Jamaica by Williams to P. Miller.

DISTRIBUTION: West Indies and possibly parts of Central America and southern Mexico, now widely cultivated but commercially most important in Jamaica.

LOCAL NAMES AND USES: The usual names are *allspice* and *pimento*. Fruits are picked green and are dried; they seem to suggest the flavors of cinnamon, nutmeg, and cloves and are used to flavor foods. Oil distilled from the leaves is used in perfumery and also medicinally. The tree is sometimes grown ornamentally.

Although the record is not supported by Fijian herbarium vouchers, *Pimenta dioica* was recorded by J. W. Parham as growing in the Suva Botanical Gardens in 1959.

2. *Pimenta racemosa* (Mill.) J. W. Moore in Bishop Mus. Bull. 102: 33. 1933; J. W. Parham, Pl. Fiji Isl. ed. 2. 198. 1972.

Myrtus caryophyllata sensu Jacq. Obs. Bot. 2: 1. 1767; non L. (1753).

Caryophyllus racemosus Mill. Gard. Dict. ed. 8. 1768.

Myrtus acris Sw. Nov. Gen. & Sp. Prodr. 79. 1788.

Pimenta acris Kostel. Allg. Med.-Pharm. Fl. 1526. 1835; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 100. 1948, Pl. Fiji Isl. 137. 1964.

Pimenta racemosa var. *racemosa*; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 101. 1972.

A tree to 12 m. high, cultivated and sometimes naturalized near sea level. The leaves have petioles 3–10 mm. long and elliptic to obovate blades 4–10 × 2.5–6 cm.; the flowers are about 10 mm. in diameter and the fruits 7–12 mm. in diameter at maturity, said to be black and with brown seeds. Flowers are noted in Fiji between September and November and fruits a few months later.

TYPIFICATION AND NOMENCLATURE: *Caryophyllus racemosus*, providing the first available epithet for the *Pimenta* with 5-merous flowers, was mentioned by Miller as growing naturally in the Moluccas and in Jamaica, but of course in the first locality it was not indigenous. *Myrtus acris* was based by Swartz on *M. caryophyllata* sensu Jacq. and hence on Jacquin's West Indian material; this would be the lectotype species of *Amomis* O. Berg if that genus were separated from *Pimenta*.

DISTRIBUTION: West Indies and possibly also in northern South America, now widely cultivated elsewhere but commercially most important in the Lesser Antilles and some of the other West Indian islands. In the southern Pacific it is grown ornamentally in at least Samoa, the Cook Islands, and the Societies, as well as in Fiji, and is said to be naturalized and spreading in parts of Samoa.

LOCAL NAMES AND USES: Commonly known as *bay rum tree*, *bay oil tree*, or *bay tree*. An oil distilled from the leaves and twigs is used in perfumery and in the preparation of bay rum, a fragrant cosmetic and medicinal liquid. The tree is also considered useful for ornament and shade.

AVAILABLE COLLECTIONS: VITI LEVU: SERUA: Ndeumba, DA 17203. NAITASIRE: Cocoa Station, Nanduruloulou, DA 12260. REWA: Suva, Government House garden, DA L11441; Suva, in private garden, DA 16076; also recorded from Suva Botanical Gardens by J. W. Parham, 1948. VANUA LEVU: THAKAUNDROVE: Namale, DA 17317. VANUA LEVU without further locality, H. B. R. Parham 333.

Pimenta racemosa was probably first introduced into Fiji by J. B. Thurston as the plant listed in his 1886 *Catalogue* as *Eugenia pimenta* (a synonym of *Pimenta dioica*); DA 16076 is from the garden of the second Sir Maynard Hedstrom, which was formerly Thurston's "Thornbury."

7. *PSIDIUM* L. Sp. Pl. 470. 1753.

Shrubs or small trees; leaves opposite or disjunct-opposite, the blades pinnate-

nerved; inflorescences solitary, axillary, mostly 1- or 3(4-7)-flowered dichasial cymes (uniflorescences triadic or monadic, pedunculate), the flowers sessile above ultimate articulation; hypanthium prolonged above summit of ovary, the calyx limb of 4 or 5 distinct teeth or lobes or completely closed in bud or with an apical pore, usually splitting irregularly down to ovary at anthesis; petals 4 or 5, spreading, often showy, white in our species; disk broad; stamens numerous, free; ovary usually 3- or 4(2-7)-locular, the placenta usually bilamellate, with numerous ovules; fruits baccate, the sepals usually persistent; seeds embedded in pulp, hipocrepiform or reniform, the testa bony, the embryo uncinatate or curved, the cotyledons small.

TYPE SPECIES: *Psidium guajava* L.

DISTRIBUTION: Tropical and subtropical America, with 100-150 species; two widespread species are naturalized in Fiji.

KEY TO SPECIES

- Young parts and lower surfaces of leaf blades finely appressed- or spreading-pilose, at length glabrescent, the young branchlets sharply 4-angled or -winged; leaf blades elliptic or oblong, usually 5-14 × 3-7 cm. and broadly obtuse to rounded at base and apex, the lateral nerves spreading, 7-20 per side, narrowly depressed to slightly prominulous above, prominent beneath; peduncle of usually 1-flowered inflorescence 10-15 mm. long; fruits ovoid to globose to pyriform, at maturity (3-) 4-8 (-12) cm. long, yellow, with pink to cream-colored pulp. 1. *P. guajava*
- Young parts and foliage essentially glabrate even when young, the young branchlets terete; leaf blades obovate-cuneate, usually 3.5-9 × (2.5-) 3-6 cm., attenuate to acute at base and obtusely cuspidate at apex, the lateral nerves subsacending, 5-9 per side, slender but slightly elevated on both surfaces; peduncle of usually 1-flowered inflorescence 4-8 mm. long; fruits globose to obovate, at maturity 2-3 cm. in diameter, purplish red, with white pulp. 2. *P. cattleianum*

1. *Psidium guajava* L. Sp. Pl. 470. 1753; Seem. in Bonplandia 9: 256. 1861; Christophersen in Bishop Mus. Bull. 128: 158. 1935; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 13: 47. 1942; Greenwood in Proc. Linn. Soc. 154: 98, as *P. guayava*. 1943; Yuncker in Bishop Mus. Bull. 178: 90. 1943, in op. cit. 184: 54. 1945; Mune & J. W. Parham in Agr. J. Dept. Agr. Fiji 27: 103, pl. 1-5. 1956, in Dept. Agr. Fiji Bull. 31: 16, fig. 3, pl. II-V. 1957; J. W. Parham in op. cit. 35: 58, fig. 22. 1959, Pl. Fiji Isl. 137. 1964, ed. 2. 198. 1972; Mune & J. W. Parham in Dept. Agr. Fiji Bull. 48: 32, fig. 9. 1967; Pursglove, Trop. Crops, Dicot. 414, fig. 66. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 131. 1970; St. John & A. C. Sm. in Pacific Sci. 25: 334. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 46, 132. 1972.

An abundantly naturalized tree or shrub 1-10 m. high from near sea level to about 800 m., often forming dense thickets in waste places, along roadsides, and in pastoral, arable, and plantation land. The petioles are 2-7 (-10) mm. long, the leaf blades prevailing elliptic or oblong, the petals elliptic and 10-20 mm. in diameter, and the copious fruits yellow. Flowers and fruits occur throughout the year.

TYPIFICATION: Linnaeus listed several prior references, but I have not noted a lectotypification.

DISTRIBUTION: Tropical America, now widespread in tropical areas, cultivated for its fruit but also readily naturalizing and in many areas a weed difficult to eradicate. About 25 Fijian collections have been seen, but they give an inadequate idea of its abundance.

LOCAL NAMES AND USES: In Fiji the *guava* is known as *ngguava*, *ngguava ni India*, and *amrut* (Hindi). The ripe fruits may be eaten fresh or the mesocarp stewed and used for pies and pastries. After removal of the seeds the fruit pulp is used in preserves, jams, jellies, paste (sweetmeats), and juices. Several or many cultivars have been developed. The species was already established at the time of Seemann's visit in 1860, although

mention was omitted from *Flora Vitiensis*. It is now for the most part considered a nuisance in Fiji and is a declared noxious weed (for control cf. Mune and Parham, 1967).

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Lautoka, *Greenwood 352*; vicinity of Nandi, *DA 10702*; slopes of escarpment north of Nandarivatu, *Smith 6079*. NANDRONGA & NAVOSA: Nathotholevu, near Singatoka, *H. B. R. Parham 125*. NAITASIRE: Sawani-Serea road, *DA 11294*. TAILEVU: Korovou or Naivithula, *Valentine 15, 16*; Mbau road, *DA 10598*. REWA: Samambula A Camp, *DA 3698*. OVALAU: Wainiloka, *DA 1341*. VANUA LEVU: MATHUATA: Nakama, Wailevu River, *DA 8737*. THAKAUNDRIVE: Between Nikawa Bay and Valethi, *Bierhorst F78*. VANUA MBALAVU: Near Lomaloma, *Garnock-Jones 1085*. LAKEMBA: Near Nukunuku Village, *Garnock-Jones 817*. FIJI without definite locality, "Mbau, Rewa, Ovalau," *Seemann 167*.

2. *Psidium cattleianum* Sabine in Trans. Hort. Soc. London 4: 317. pl. 11. (May or June) 1821; Schroeder in J. Arnold Arb. 27: 314. 1946; J. W. Parham, Pl. Fiji Isl. ed. 2. 198. 1972.

Psidium littorale Raddi in Opusc. Sci. 4: 254. pl. 7, fig. 2. (presumably later than May) 1821; Merr. & Perry in J. Arnold Arb. 19: 199. 1938; Fosberg in Proc. Biol. Soc. Wash. 54: 179. 1941; Greenwood in J. Arnold Arb. 25: 397. 1944, in op. cit. 30: 77. 1949; J. W. Parham in Dept. Agr. Fiji Bull. 35: 59. 1959, Pl. Fiji Isl. 138. 1964; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 46. 1972.

A locally naturalized shrub or small tree 2-6 m. high occurring near sea level or at low elevations, usually in beach thickets. The petioles are 5-8 mm. long, the leaf blades prevalently obovate-cuneate, and the fruits purplish red. Flowers and fruits have been obtained between November and June.

TIPIFICATION AND NOMENCLATURE: *Psidium cattleianum* was described from a cultivated plant raised from seed received from China and growing in William Cattle's conservatory at Barnett. The type of *P. littorale* was presumably a Brazilian plant. As these two names were published at nearly the same time, each has been used by various botanists. The date of Sabine's publication (May or June, 1821) is derived from an original wrapper, as indicated in a note by W. T. Stearn in the Kew copy. The precise date of publication of Raddi's name cannot be stated, but it was also in 1821 and presumably later than May. The discussion by Schroeder (1946, cited above) is pertinent. Fosberg (in Occas. Pap. Bishop Mus. 23: 37. 1962) considers the two names worthy of varietal distinction.

DISTRIBUTION: Tropical America, spread in other tropical areas by cultivation and ready naturalization, although it is not an obnoxious weed like *Psidium guajava*. In Fiji *P. cattleianum* seems thoroughly naturalized only in a limited area along the southern coast of Viti Levu. It is presumably a comparatively recent arrival, first introduced in the vicinity of Navua prior to 1943 (Greenwood, 1944, 1949, cited above).

LOCAL NAMES AND USES: Noted as *small guava*, *ngguava*, *strawberry guava*, and *cherry guava*. The fruit pulp has a sweet acid flavor and can be eaten raw or made into jams and jellies.

AVAILABLE COLLECTIONS: VITI LEVU: SERUA: "In hills," *Greenwood 1026*; flat coastal strip in vicinity of Ngaloa, *Smith 9509*; beaches near mouth of Taunovo River, *Vaughan 3446a*, *DF 348 (Damanu 37)*; Ndeumba beaches, *DA 9177 (McKee 2741)*, *11464*, *12510*. NAITASIRE: Koronivia, *DA 6035*.

8. MYRTUS L. Sp. Pl. 471. 1753.

Shrubs or perhaps trees; leaves opposite, the blades with aromatic oil glands; inflorescences axillary, 1-flowered (uniflorescence monadic, pedunculate), the flowers sessile above articulation; hypanthium subglobose, not produced above ovary; sepals 5, free, appressed in bud; petals 5, suborbicular, spreading; stamens numerous, free, the anthers with parallel locules; ovary 2- or 3-locular, the ovules numerous; fruits

baccate, 2- or 3-locular, the sepals persistent, the seeds numerous, reniform, the testa usually bony, the cotyledons small at one end of a curved embryo.

LECTOTYPE SPECIES: *Myrtus communis* L., one of Linnaeus's seven original species (vide de Candolle, Note Myrt. 7. 1826, in Bory, Dict. Class. Hist. Nat. 11: 406. 1827).

DISTRIBUTION: *Myrtus* was very broadly construed by nineteenth century students of the family. McVaugh (in Taxon 17: 402. 1968) implies that the genus might best be limited to Old World species including the generic type. This, a widely cultivated species, is recorded from Fiji.

Briggs and Johnson (1979, cited under the family, pp. 221, 222) restrict *Myrtus* to two species of Europe, western Asia, and northern Africa.

1. *Myrtus communis* L. Sp. Pl. 471. 1753; J. W. Parham, Pl. Fiji Isl. ed. 2. 198. 1972.

Shrub or small tree 1-3 (-5) m. high, sparingly cultivated at an elevation of about 800 m. The short-petiolate, aromatic leaves have coriaceous, pellucid-punctate, acute blades 2.5-5 cm. long; the flowers, borne on peduncles to 2.5 cm. long, are 1.5-3 cm. in diameter, with white petals; and the fruits are broadly ellipsoid to subglobose, usually 7-10 × 6-8 mm. and dark blue at maturity.

TYPIFICATION: Linnaeus cited prior references and recognized several varieties, but a lectotypification has not been noted.

DISTRIBUTION: Europe, the Mediterranean area, northern Africa, and western Asia. Because of its long cultivation, the more precise region of origin is questionable. It is not suited to most tropical areas but is sometimes cultivated in subtropical regions or tropical uplands. The single available Fijian collection, from a montane settlement, is presumably from a comparatively recent introduction which may not have persisted.

LOCAL NAME AND USES: This well-known ornamental is widely known as *myrtle*. The flowers and leaves are a source of perfume, and the berries are used to flavor food and wine.

AVAILABLE COLLECTION: VITI LEVU: MBA: Nandarivatu, DA 8529.

9. *DECASPERMUM* J. R. & G. Forst. Char. Gen. Pl. 37. 1775, ed. 2. 73. 1776; A. J. Scott in Kew Bull. 34: 60. 1979.

?*Nelitis* Gaertn. Fruct. Sem. Pl. 1: 134, nom. illeg. (?). 1788; sensu A. Gray, Bot. U. S. Expl. Exped. 1: 547. 1854; Seem. Fl. Vit. 80. 1865.

Trees or shrubs, the young parts and inflorescences glabrous or pilose, the branchlets terete or 4-angled, the stipules small, filiform, fugacious; leaves opposite, petiolate, the blades glandular-punctate, pinnate-nerved, with an intramarginal vein; inflorescences sometimes terminal and paniculate, sometimes axillary racemes or thyrsoids or dichasia or with solitary flowers (uniflorescence paniculate, metabotryoidal, botryoidal, triadic, or monadic, pedunculate), the flowers (4- or 5-merous, ♂ or sometimes ♂, with or without short antpodia, with often small and deciduous bracteoles; hypanthium globose to campanulate or infundibular, not produced above ovary; sepals free in bud, subequal, persistent; petals spreading, glandular-punctate, white or pink; stamens numerous, 1-several-seriate, the filaments filiform, the anthers subglobose, dorsifixed, dehiscent longitudinally, the connective with a terminal gland; ovary 3-12-locular, the ovules usually 2 (-4) per locule, collateral, the style filiform, the stigma capitate or peltate; fruits baccate, subglobose, longitudinally inconspicuously sulcate, the seeds usually 2 per locule and separated by a false septum, the testa bony, the embryo hippocrepiiform, with a long radicle and short cotyledons.

TYPE SPECIES: *Decaspermum fruticosum* J. R. & G. Forst. The type species of *Nelitis* is *N. jambosella* Gaertn.; whether or not *Nelitis* is an illegitimate name is discussed by Scott (1979).

DISTRIBUTION: India, southern China, and southeastern Asia through Malesia to Micronesia, eastern Australia, and eastward to the Society Islands, with about 30 species. Two indigenous (and endemic) species occur in Fiji.

USEFUL TREATMENT OF GENUS: SCOTT, A. J. The Austral-Pacific species of *Decaspermum* (Myrtaceae). Kew Bull. 34: 59-67. 1979.

KEY TO SPECIES

Inflorescences compound, several-many-flowered thyrsoids 2-8 cm. long, very rarely depauperate and (?)-few-flowered, the peduncles of uniflorescences 3-9 mm. long at anthesis; leaves comparatively well spaced (internodes usually 0.5-2 cm. long), the petioles 1-6 mm. long, the blades predominantly ovate and 2-7 × 1-3.5 cm., sharply acute to acuminate at apex, inconspicuously glandular-punctate, with inconspicuous but visible secondaries. 1. *D. vitiense*
 Inflorescences axillary, 1-flowered, the peduncles 2-4 mm. long at anthesis; leaves congested (internodes 1-3 mm. long), the petioles 1-2 mm. long, the blades elliptic to obovate, 5-12 × 3-6 mm., obtuse to rounded at apex, conspicuously black-glandular-punctate, with immersed secondaries. 2. *D. cryptanthum*

1. *Decaspermum vitiense* (A. Gray) Niedenzu in Engl. & Prantl, Nat. Pflanzenfam. III. 7: 69. 1893; Guillaumin in J. Arnold Arb. 12: 254. 1931; A. J. Scott in Kew Bull. 34: 64. 1979. FIGURE 51A-C.

Nelitris vitiensis A. Gray, Bot. U. S. Expl. Exped. 1: 548. 1854, Atlas, pl. 60, B. C. 1856, in Bonplandia 10: 35. 1862, in Proc. Amer. Acad. Arts 5: 317. 1862; Seem. in Bonplandia 10: 296. 1862, Viti, 436. 1862, Fl. Vit. 80, p. p. 1865, op. cit. 427. 1873; Engl. in Bot. Jahrb. 7: 467. 1886.

Nelitris fruticosa sensu A. Gray, Bot. U. S. Expl. Exped. 1: 547, p. p. 1854, Atlas, pl. 60, D. 1856; Seem. in Bonplandia 9: 256. 1861, Viti, 436. 1862, Fl. Vit. 80, p. p. 1865; non sensu typi.

Myrtus vitiensis F. v. Muell. in Pap. & Proc. Roy. Soc. Tasmania 1875: 165. 1876; J. W. Parham, Pl. Fiji Isl. 137. 1964.

Decaspermum fruticosum sensu Drake, Ill. Fl. Ins. Mar. Pac. 168, p. p. 1890; Gibbs in J. Linn. Soc. Bot. 39: 146. 1909; J. W. Parham, Pl. Fiji Isl. 137. 1964, ed. 2. 196. pl. II. 1972; non J. R. & G. Forst.

A shrub or tree 2-14 m. high, sometimes compact, found at elevations from near sea level to 1,195 m. in dry or open forest or on its edges, in thickets, on open hillsides, and in the low forest of crests and ridges. The young parts and sometimes parts of inflorescences and flowers are pale-sericeous. The leaf blades are very variable, ovate or ovate-lanceolate to elliptic, sometimes as large as 8 × 4 cm. but usually smaller, often with a pronounced acumen to 2 cm. long. The inflorescences are usually copiously flowered and bear bracts 3-7 mm. long grading into small leaves; the fugacious bracteoles are 1-1.5 mm. long; the petals are usually 3-4 × 2.5-3 mm., white or pink-tinged; the stamens have white to pink filaments and yellow anthers; and the fruits are bluish green, becoming black and 3-7 mm. in diameter at maturity, with 8-10 seeds. Flowers and fruits occur throughout the year.

TYPIFICATION: The species was based on specimens obtained by the U. S. Exploring Expedition in Fiji in 1840, recorded by Gray as from Ovalau and Vanua Levu (Mathuata). Although the precise localities of the several available specimens cannot now be indicated, an appropriate citation is: *U. S. Expl. Exped.* (us 73807 LECTOTYPE; putative ISOLECTOTYPES at GH, K, P). The indicated lectotype was the principal basis of Gray's concept, providing the ♂ flowers figured in his pl. 60, B, C (fig. 1-5). Gray's unnamed "var. β" seems based on us 73806, which provided the ♀ flowers figured in pl. 60, C (fig. 6-8); a third US specimen (73808) is from the depauperate plant referred by Gray to his new combination *Nelitris fruticosa* and figured in pl. 60, D. Scott (1979) incorrectly cited the holotype as being at A; actually the Harvard specimens of the U. S.

FIGURE 51. A-C, *Decaspermum vitiense*; A, distal portions of branchlets, with foliage and inflorescences with ♂ flowers, × 1/2; B, detail of inflorescence with ♀ flowers, × 4; C, portion of infructescence, × 2. D & E, *Decaspermum cryptanthum*; D, flower, showing bracteoles, sepals, 1 petal, most stamens, style, and stigma, × 15; E, distal portions of branchlets, with foliage and 1-flowered inflorescences, × 2. A from Smith 204, B from Gillespie 4353, C from Degener 14598, D & E from Smith 685.



Exploring Expedition are at GH, but the US set includes the holotypes of Gray's novelties except under unusual circumstances (cf. vol. 1 of this *Flora*, p. 40).

DISTRIBUTION: Endemic to Fiji and one of its most abundant flowering plants, thus far known from ten islands and to be anticipated on many others; approximately 140 collections have been examined.

LOCAL NAMES AND USES: *Nungga* or *nungganungga*, on Vanua Levu often *nonggo* or *nonggononggo*; known also as *Fiji Christmas bush*. A very abundant and attractive plant often used ornamentally and for Christmas decoration. Larger trees are sometimes considered useful as timber.

REPRESENTATIVE COLLECTIONS: VITI LEVU: M̄BA: Summit of Mt. Koroyanitu, high point of Mt. Evans Range, *Smith 4178*; Nandarivatu and vicinity, *Gibbs 552*, *Degener 14598*; summit of Mt. Nangaranambuluta, east of Nandarivatu, *Gillespie 4353*. NANDRONGA & NAVOSA: Nausori Highlands, *DF 285 (Damau 13)*; Vicinity of Mbelo, near Vatukarasa, *Tabualewa 15633*. SERUA: Nathengathenga Creek, upper Serua River, *DF 973*; hills west of Waivunu Creek, between Ngaloa and Korovou, *Smith 9220*. NAMOSI: Near summit of Mt. Naitarandamu, *Gillespie 3236*; vicinity of Namosi, *Parks 20288*. RA: Vicinity of Rakiraki, *Degener & Ordenez 13701*. NAITASIRI: Waindina River basin, *MacDaniels 1027*; vicinity of Nasinu, *Gillespie 3605*. REWA: Mt. Korombamba, *Parks 20112*. VATULELE: Taunovo, *DA 3791*. KANDAVU: Hills above Namalata and Ngaloa Bays, *Smith 204*. OVALAU: Summit of Mt. Ndelaiovalau and adjacent ridge, *Smith 7556*; mountains northwest of Levuka, *Gillespie 4567*. NAIRAI: *Milne 175*. VANUA LEVU: M̄BUA: Vicinity of Nandi Bay, *Milne 214*. MATHUATA: Ndreketi River, *DF 253 (Bola 101)*; summit ridge of Mt. Numbuloua, east of Lambasa, *Smith 6469*. THAKAUNDRIVE: Nakoroutari, *DA 10482*; Maravu, near Salt Lake, *Degener & Ordenez 14133*. TAVEUNI: Western slope, between Somosomo and Wairiki, *Smith 724*. VANUA MBALAVU: Near Lomaloma, *Garnock-Jones 987*. LAKEMBA: *Bryan 532*. FIJI without detailed locality, *Harvey, Seemann 166* ("Lakemba; common in Kandavu, Moturiki, Viti Levu"), *Storck 888*.

Decaspermum fruticosum J. R. & G. Forst. has often been taken to include *D. vitiense* and to extend from India, China, and southeastern Asia to the Society Islands (e. g. Merr. & Perry in *J. Arnold Arb.* 19: 201. 1938; Backer & Bakh. f. *Fl. Java* 1: 335. 1963). Gray (1854, pp. 547-549) appreciated the differences between Fijian material and *D. fruticosum*, although he referred one depauperate Fijian specimen to the latter. Scott (1979, pp. 60-62) limits *D. fruticosum* to the Societies, Samoa, and Tonga; it also occurs in the Horne and Wallis Islands (St. John & A. C. Sm. in *Pacific Sci.* 25: 334. 1971) and may be anticipated in the Cook Islands.

Scott's (1979, p. 61) indication that the holotype of *Decaspermum fruticosum* is at K may be questioned. At BM there are three sheets of the species from the Cook voyages, and I would take as the lectotype the one of these in flower that has been labelled "type specimen" and is inscribed "G. Forster's Herbarium" and "*Decaspermum* Linn. Suppl. 252. M. S. V. 461." Other specimens from the Cook voyages may or may not be precise isolectotypes.

2. *Decaspermum cryptanthum* A. J. Scott in *Kew Bull.* 34: 63. 1979. FIGURE 51D & E.

Mooria microphylla A. C. Sm. in *Bishop Mus. Bull.* 141: 110. fig. 57, e-g. 1936.

Clœzia microphylla A. C. Sm. in *J. Arnold Arb.* 36: 286. 1955; J. W. Parham, *Pl. Fiji Isl.* 136. 1964, ed. 2. 196. 1972.

Decaspermum microphyllum J. W. Dawson in *Allertonia* 1: 404. 1978; non Merr. (1921).

A rounded, compact shrub 1-3 m. high known from a single collection obtained in dense crest thickets at an elevation of 1,030 m. The young parts are evanescently sericeous, and the small, congested leaves have blades with conspicuous black glands. The petals are white and 2.5-3 mm. long.

TYPIFICATION AND NOMENCLATURE: The type is *Smith 685* (BISH HOLOTYPE; many ISOTYPES), collected in flower Nov. 29, 1933, in dense thickets on the summit of Mt. Mbatini, Thakaundrove Province, Vanua Levu. (Scott, 1979, indicated an isotype as being at A; the Harvard duplicate is actually a GH specimen.) *Clœzia* Brongn. & Gris

(*Mooria* Montr., 1860, non *Moorea* Lem., 1854, nom. rejic.) is restricted to New Caledonia. Correctly transferring the species to *Decaspermum* in 1978, Dawson overlooked the prior use of the epithet *microphyllum* by Merrill.

DISTRIBUTION: Endemic to Fiji and thus far known only from the type collection, obtained on the highest point of Vanua Levu. Dawson (1978) mentions New Guinean species of this relationship, thus suggesting that waif introductions from the west gave rise to two endemic Fijian and Society Island species.

Decaspermum cryptanthum does not suggest the common Fijian species, *D. vitiense*, being closely related only to *D. lanceolatum* J. W. Moore, of Raiatea, from which it differs in its elliptic to obovate (rather than lanceolate and proportionately narrower) and more copiously glandular leaf blades, shorter peduncles (the flowers being nearly concealed by the foliage), smaller bracteoles, slightly larger sepals, and smaller petals.

10. SYZYGIVM Gaertn. Fruct. Sem. Pl. 1: 166. 1788; Merr. & Perry in J. Arnold Arb. 19: 99, 205. 1938, in Mem. Amer. Acad. Arts 18: 140. 1939, in Sargentia 1: 74. 1942; Merr. in Philipp. J. Sci. 79: 365. 1950; Perry in J. Arnold Arb. 31: 350. 1950; Backer & Bakh. f. Fl. Java 1: 337. 1963; Hartley & Perry in J. Arnold Arb. 54: 160. 1973; P. Ashton in Rev. Handb. Fl. Ceylon 2: 420. 1981. Nom. cons.

Caryophyllus L. Sp. Pl. 515. 1753. Nom. rejic.

Syzygium P. Br. Hist. Jam. 240. 1756. Nom. rejic.

Jambos Adanson, Fam. Pl. 2: 88, 564. 1763. Nom. rejic.

Jambosa Adanson corr. DC. in Bory, Dict. Class. Hist. Nat. 11: 407. 1827 (preprint, 8. 1826). Nom. cons. vs. *Jambos* sed nom. rejic. vs. *Syzygium*.

Eugenia sensu A. Gray, Bot. U. S. Expl. Exped. 1: 509, p. p. 1854; Seem. Fl. Vit. 76, p. p. 1865; non L. Pareugenia Turill in Hook. Icon. Pl. 31: pl. 3004. (Jan.) 1915, in J. Linn. Soc. Bot. 43: 21. (May) 1915.

Eugenia sect. *Syzygium* Henderson in Gard. Bull. Singapore 12: 11, 17. 1949.

Trees or shrubs, glabrous throughout (all our species) or sometimes with indument of multicellular hairs, the distal branchlet internodes sometimes angled or winged; leaves opposite or pseudoverticillate, infrequently ternate, usually petiolate but sometimes sessile, the blades chartaceous to coriaceous, glandular-punctate but often obscurely so, pinnate-nerved, usually with an obvious intramarginal collecting nerve, one or two outer collecting nerves often present; inflorescences terminal or axillary or borne on defoliate branchlets or on larger branches or trunks, paniculate or metabotryoid or thyrsoidal (rarely consisting of only 1–3 flowers), often freely branched and many-flowered, the axes bracteate (bracts persistent or fugacious), the flowers large to small, sessile, in triads (or small clusters) or solitary on anthopodia; hypanthium obovoid-clavate to turbinate, obconical, or campanulate, often tapering and narrowed proximally into a stipe (pseudostalk, pseudopedicel), distally produced beyond summit of ovary into a hypanthial rim (this usually obvious); sepals 4 (as usual in our species) or 5, borne on outer margin of hypanthial rim, large (and usually persistent) to small (and usually caducous, but then usually leaving at least an occasional trace on hypanthial rim); petals 4 (as usual in our species) or 5, borne on margin of hypanthial rim, free and spreading or coherent and imbricate and then calyprate, usually fugacious; stamens numerous, 1–several-seriate, borne on inner (adaxial) surface of hypanthial rim or on its margin within petals, strongly inflexed in bud, the filaments filiform, free or proximally united into several–many phalanges, the anthers ellipsoid or oblong, dorsifixed, 2-locular, longitudinally dehiscent; intrastaminal disk lining upper hypanthial surface thin and cupuliform to cushionlike and flattened on upper surface; ovary 2 (infrequently 3- or 4-)locular, the placentation axile, the ovules numerous, spreading from placenta, the style slender to stout, often curved in bud, the stigma small; fruits baccate, subglobose to ellipsoid, pyriform, or subcylindric, the pericarp thick-carnose to leathery, the hypanthial rim persistent but often inconspicuous; seed 1

(sometimes seeds 2-4), the testa loosely adherent to pericarp, the cotyledons large, often thick-carnose or corneous, plano-convex, appressed to one another and enclosing the hypocotyl, infrequently superposed, infrequently thinner and sinuously inter-amplectant, the two opposing faces distinct or rarely interlocking but without intrusive placental tissue.

TYPE SPECIES AND NOMENCLATURE: *Syzygium* is typified by *S. caryophyllaeum* Gaertn. (vide Merrill and Perry in Mem. Amer. Acad. Arts **18**: 141. 1939; McVaugh in Taxon **5**: 164. 1956; typ. cons.). *Syzygium*, Browne's earlier and now rejected name, had as its type *Myrtus zuzygium* L. *Caryophyllus* L., the earliest name for this complex but now rejected in favor of *Syzygium*, had as its only species *C. aromaticus* L. (*Syzygium aromaticum* (L.) Merr. & Perry). *Jambosa* Adanson (as corrected by de Candolle) is a conserved name over *Jambos* Adanson, but it is rejected against *Syzygium* if the two are combined; its conserved type is *J. vulgaris* DC., nom. illeg. (*Eugenia jambos* L. = *J. jambos* (L.) Millsp. = *Syzygium jambos* (L.) Alston). The type and only original species of *Pareugenia* is *P. imthurnii* Turrill, now referred to *Syzygium brackenridgei* (A. Gray) C. Muell. These generic names and others have been discussed by Merrill and Perry in references cited above (especially in 1939); their original proposal to conserve *Syzygium* to include the earlier *Caryophyllus* and *Jambos* (corrected to *Jambosa*) is now followed by most taxonomists discussing Old World Myrtaceae.

DISTRIBUTION: Paleotropical, probably with 1,000 or more species. Thirty-three species are here recorded from Fiji, 28 of them indigenous (20 of these endemic) and five cultivated and sometimes naturalized (one of these, *Syzygium malaccense*, probably being an aboriginal introduction and so firmly established as to seem indigenous).

USEFUL TREATMENTS OF GENUS (in addition to papers listed under the family): MERRILL, E. D., & L. M. PERRY. On the Indo-Chinese species of *Syzygium* Gaertner. J. Arnold Arb. **19**: 99-116. 1938. MERRILL, E. D., & L. M. PERRY. Myrtaceae: *Syzygium* Gaertner. Sargentia **1**: 74-78. 1942. PERRY, L. M. Notes on some Myrtaceae of Fiji. J. Arnold Arb. **31**: 350-371. 1950. HARTLEY, T. G., & L. M. PERRY. A provisional key and enumeration of species of *Syzygium* (Myrtaceae) from Papuaasia. J. Arnold Arb. **54**: 160-227. 1973.

Comments on a reasonable interpretation of the genus *Syzygium* have been provided in many papers cited above under the genus or family, the discussion of Merrill and Perry in their treatment of Bornean species (1939, pp. 135-140) bringing the situation to a conclusion that most recent regional studies have utilized. As Merrill and Perry have pointed out, all intergrades are to be found in the degree to which petals are entirely free to closely imbricate and calyprate. Equally unsatisfactory are flower size, free vs. coherent filaments, the conspicuous or inconspicuous intrastaminal disk, and the degree to which the cotyledons of the seed are free or with interlocking faces. Species with large flowers and free petals have often been referred to *Jambosa* as distinct from *Syzygium*, with smaller flowers and coherent, calyprate petals, but there are all possible intergrades between these extremes.

The following key to species occurring in Fiji is largely adapted from that of Perry (1950), which suggests that our species of *Syzygium* fall into three readily recognized groups. (1) Species 1-5, with inflorescence bracts and bracteoles persistent, hypanthium not produced proximally into a stipe, small and calyprate petals, and filaments sometimes connate into phalanges; some of these would fall into *Pareugenia* if that should be maintained as a distinct genus. (2) Species 6-21, with inflorescence bracts and bracteoles caducous, hypanthium usually proximally narrowed into a stipe and

small (less than 1 cm. long at anthesis), small and calyprate petals, and free filaments. These species fall into *Syzygium* sensu str. (3) Species 22-32 differ from those of the preceding group in having the hypanthium large (infrequently less than 1 cm. long at anthesis) and the petals comparatively large and free, not calyprate. If *Jambosa* were retained as a genus, these species could be there referred. Species 33 (*Caryophyllus*) is keyed here because of its elongate hypanthium, but in many respects it fits better into Group 2.

Measurements in the following key referring to the hypanthium were made at anthesis or in bud just prior to anthesis; length is measured from the basal junction of the hypanthium (including its stipe or "pseudostalk") with its anthopodium (or with the ultimate internode of the inflorescence branchlet) to the apex of the hypanthial rim (on which sepals and petals are based); breadth is measured across the broadest point, which usually coincides with the rim base; length of the rim is measured from its apex to the approximate level of the summit of the ovary (base of style).

KEY TO SPECIES GROUPS

- Inflorescence bracts and bracteoles usually broader than long, persistent through anthesis and often in infructescences (if rarely caducous at anthesis then leaving obvious, crescent-shaped scars); hypanthium campanulate to turbinate-cylindric, to 7 (-10) mm. long and 7 mm. in subapical diameter, obtuse or rounded at base and there subtended by paired (or 4 or 6) amplexant bracteoles; sepals to 1.5 × 5 mm.; petals small, suborbicular, 3-7 mm. in diameter, coherent into a calyptra falling at anthesis; stamens borne on margin of hypanthial rim within petals, the filaments not more than 12 mm. long; expanded flowers at full anthesis (measured across spreading stamens) not more than 2.5 cm. in diameter; indigenous species. GROUP 1 (species 1-5)
- Inflorescence bracts and bracteoles usually longer than broad, caducous, rarely persisting at anthesis, the scars small and inconspicuous; hypanthium clavate to infundibular, pyriform, turbinate, obconical, or cylindric, narrowed to a stipitate or obtuse or rounded base and there without amplexant bracteoles; indigenous and introduced species.
- Flowers comparatively small, the hypanthium (including stipe) at anthesis 1.5-10 mm. long and 1.5-7 mm. in subapical diameter; sepals to 2 × 5 mm.; petals suborbicular to elliptic or obovate, (1-) 2-8 mm. in diameter, coherent and calyprate at anthesis without expanding (rarely briefly persistent at anthesis); stamens borne on margin of hypanthial rim within petals, the filaments 1-18 mm. long; expanded flowers at full anthesis (measured across spreading stamens) rarely more than 2.5 cm. in diameter. GROUP 2 (species 6-21)
- Flowers comparatively large, the hypanthium (including stipe) at anthesis 7-20 (-35) mm. long and 6-14 (-20) mm. in subapical diameter; sepals (2-) 3-15 × 6-23 mm., often accrescent in fruit; petals suborbicular to elliptic, 7-23 mm. in diameter, usually expanded at anthesis and singly deciduous; stamens borne on inner (adaxial) surface of hypanthial rim, the filaments 15-45 (-50) mm. long; expanded flowers at full anthesis (measured across spreading stamens) 3-10 cm. in diameter (exception: flowers of sp. 33 smaller, 1.5-2 cm. in expanded diameter, with sepals about 2 × 4 mm., petals about 10 × 5 mm., and filaments 3-7 mm. long). GROUP 3 (species 22-33)

KEYS TO SPECIES

GROUP 1

- Distal branchlet internodes robust, usually 10-15 mm. in diameter and sharply triquetrous, bearing coriaceous, elongate-deltoid bracts (20-30 mm. long); leaves ternate, the petioles lacking (then represented by leaf blade costae) or to 10 mm. long, very stout (usually 10-14 mm. thick), winged or sharply angled to base; leaf blades thick-coriaceous, obovate, up to 45 × 21 cm., retuse-rounded to short-cuspidate at apex, the costa sharply carinate beneath; inflorescences basally subtended by cauline bracts. 1. *S. wolfii*
- Distal branchlet internodes comparatively slender, (1.5-) 3-7 mm. in diameter, bluntly quadrangular or flattened or terete, lacking rigid, elongate-deltoid bracts; leaves usually opposite but sometimes congested and appearing to be in pseudowhorls of 3 or 4, obviously petiolate, the petioles usually at least 5 mm. long and 2-5 mm. in diameter, angled only distally by the decurrent bases of leaf blades; leaf blades coriaceous, not exceeding 30 × 10.5 cm., obtuse to rounded at apex or sometimes retuse or obtusely short-cuspidate, the costa prominent beneath but not sharply carinate; inflorescences not basally subtended by cauline bracts.

Leaves comparatively large, the petioles seldom less than 10 mm. long, the blades 5-30 × 3-10.5 cm., the principal secondary nerves 3-10 mm. apart; inflorescences comparatively large, 4-19 × 4-14 cm., with bracts and bracteoles 1-3 × 2-4 mm.; hypanthium 3-10 mm. long and 3-7 mm. in diameter; petals 4-7 × 5-7 mm.; stamens 80-300, the filaments 8-12 mm. long at anthesis, proximally connate into phalanges.

Disk cupuliform, often deeply so, the hypanthial rim (1-) 2-2.5 mm. long; style conical-subulate, 4-6 mm. long and 0.5-1.5 mm. in diameter at base.

Leaves usually opposite, very rarely congested and appearing to be in pseudowhorls of 3 or 4, the petioles 7-23 (-30) mm. long and 2-3 mm. in diameter, the blades elliptic-ovate to oblong-oblancheolate or obovate, 5-22 (-25) × 3-8 (-10) cm., the principal secondary nerves 15-30 per side, the collecting nerve 1-3 mm. within margin; hypanthium oblong-campanulate, 3-6.5 × 4-6 mm.; stamens 100-200, the filaments united in the lower 1-5 mm. into 10-15 phalanges of 5-15 each. 2. *S. brackenridgei*

Leaves opposite or often appearing to be in pseudowhorls of 3 or 4, the petioles 20-40 mm. long and robust, 3-5 mm. in diameter, the blades lanceolate- to elliptic-oblong, 12-30 × 4-10.5 cm., the principal secondary nerves 25-45 per side, the collecting nerve 2-5 mm. within margin; hypanthium oblong-campanulate to cylindrical-conical, 6-10 × 5-7 mm.; stamens 200-300, the filaments united into 8-10 thick-carnose phalanges of 25-40 each. 3. *S. dubium*

Disk thick-carnose, cushionlike, flat or slightly concave or slightly convex on upper surface, the hypanthial rim essentially none; hypanthium campanulate, 3-5 × 3-6 mm.; stamens 80-150, the filaments united for about half their length into phalanges of 5-20 each; style cylindrical-subulate, 2-2.5 mm. long and 0.5-0.7 mm. in diameter at base; petioles 7-25 mm. long; leaf blades elliptic to ovate- or elliptic-oblong, (4-) 12-25 × (3-) 4.5-9 cm. 4. *S. oblongifolium*

Leaves comparatively small, the petioles 3-10 mm. long, the blades narrowly oblong-elliptic to obovate or oblanceolate, (3-) 4-8 × (1-) 1.5-4.5 cm., the principal secondary nerves 15-25 per side, 2-4 mm. apart; inflorescences comparatively compact, 2.5-5 × 2-8 cm., with bracts and bracteoles not more than 1.5 × 2 mm.; hypanthium oblong-campanulate, 2-3 mm. long and in diameter, the rim about 0.5 mm. long, the disk shallowly cupuliform; petals about 2 × 2 mm.; stamens 40-60, the filaments apparently not more than 5 mm. long at anthesis, free to base. 5. *S. confertiflorum*

GROUP 2

Inflorescences borne on branchlets below leaves, on branches, and on trunks, as well as terminally, decompound-paniculate, with opposite or subopposite secondary and subsidiary branches spreading at right angles, the principal junctions usually swollen; fruits carnose or succulent when fresh, thick-walled and coriaceous in drying, 12-40 × 6-20 mm., the cotyledons collateral or superposed.

Petioles 8-35 mm. long; leaf blades coriaceous, prevalingly elliptic to lanceolate, sometimes broadly oblong or obovate, (5-) 6.5-19 × 2.5-11 cm., cuneate to obtuse at base and short-decurrent on petiole, obtuse (rarely rounded) to short-cuspidate or obtusely short-acuminate at apex, the principal secondary nerves 15-25 per side, 2-5 mm. apart and marginally interconnected by a nearly straight collecting nerve 1-2.5 mm. from margin, the veinlet reticulation copious and prominulous; inflorescences usually 5-10 cm. long and broad, not much enlarging in fruit, the ultimate flowers of inflorescence branchlets in triads or clusters of 4-8, without anthopodia (but lateral flowers on inflorescence branchlets rarely solitary on very short anthopodia); hypanthium turbinate-campanulate, at anthesis or in advanced bud 4-6 mm. long, 3-5 mm. in subapical diameter, abruptly or gradually narrowed proximally into a stipe 1-2 mm. long, the ovuliferous cavity about as broad as long; fruits broadly ellipsoid, 12-30 × 8-14 mm., obtuse at base or with a stipe not more than 3 mm. long, at apex abruptly tapering into a hypanthial rim 2-3 mm. long and 2-5 mm. in diameter, the disk shallow, 2-3 mm. deep, the cotyledons superposed; cultivated or rarely naturalized. 6. *S. cumini*

Petioles 2-10 mm. long; leaf blades submembranaceous to papyraceous or chartaceous, prevalingly lanceolate-elliptic, up to 18 × 6.5 cm., attenuate to acute (very rarely obtuse) at base and decurrent on petiole, cuspidate to acuminate at apex, the venation slender but obvious, the principal secondary nerves 8-20 per side, spreading, 2-12 mm. apart and marginally interconnected by an undulating collecting nerve 2-7 mm. from margin, an outer collecting nerve usually evident, the veinlet reticulation lax and irregular; inflorescences up to 50-100 cm. long in fruit; hypanthium clavate to pyriform, the disk deeply cupuliform; fruits fusiform to pyriform or ellipsoid, the cotyledons plano-convex and collateral; indigenous species.

Ultimate flowers of inflorescence branchlets in triads or clusters of 4-6, without anthopodia; hypanthium clavate, at anthesis or in advanced bud 4-7 mm. long, 2.5-4 mm. in subapical diameter, long-attenuate proximally into a stipe 3-4 mm. long, the ovuliferous cavity about twice as long as broad; fruits fusiform, about 3 times as long as broad, 20-45 × 6-15 mm. (dried), proximally gradually narrowed into a stout stipe 6-12 mm. long, distally gradually narrowed into a terete beak 7-10 mm. long, the hypanthial rim 3-5 mm. in diameter at apex, the disk 4-10 mm. deep; leaf

- blades usually 10–18 × 3–6.5 cm., the secondary nerves 5–12 mm. apart, the (inner) collecting nerve 2–7 mm. from margin. 7. *S. corynocarpum*
- Ultimate flowers of inflorescence branchlets solitary, individually terminating anthopodia; hypanthium pyriform to clavate-obovoid, the basal stipe not more than 2 mm. long, the ovuliferous cavity about as broad as long; fruits pyriform to ellipsoid, about twice as long as broad, obtuse at base or with a stipe not more than 3 mm. long, rounded or rounded-truncate at apex, the hypanthial rim 2–5 mm. in diameter at apex, the disk 2–6 mm. deep.
- Leaf blades usually 8–18 × 2.5–6 cm., the principal secondary nerves 3–8 mm. apart, the (inner) collecting nerve 3–7 mm. from margin; hypanthium pyriform, at anthesis or in advanced bud 6–9 mm. long, 4–6 mm. in subapical diameter; fruits ellipsoid to ellipsoid-obovoid, 25–40 × 15–20 mm. (dried). 8. *S. diffusum*
- Leaf blades usually 5–9 × 1.8–3.5 cm., the principal secondary nerves 2–5 mm. apart, the (inner) collecting nerve 1–4 mm. from margin; hypanthium clavate-obovoid, in advanced bud 4–5.5 mm. long, 2–2.5 mm. in subapical diameter; fruits pyriform to ellipsoid, 20–25 × 8–15 mm. (dried). 9. *S. purpureum*
- Inflorescences terminal, sometimes axillary on leafy branchlets or below leaves on leafy branchlets, but not occurring on major branches or on trunks (rarely so, as in *S. grayi*, but then petioles short, stout, and leaf blades thick-coriaceous, subcordate to rounded at base), not exceeding 25 cm. in length and breadth, often with ascending secondary and subsidiary branches and these often whorled or clustered at principal junctions; indigenous species.
- Flowers comparatively small, the hypanthium not more than 7 mm. long and in subapical diameter (seldom exceeding 6 × 5 mm.); petals not larger than 5 mm. in diameter (usually caducous in a calyptra when much smaller); stamens with filaments 4–12 mm. long and anthers 0.3–0.9 mm. long; style 6–12 mm. long at anthesis; fruits carnosose when fresh, thin-walled but subcoriaceous in drying, not exceeding 10 × 10 mm., the cotyledons (as far as known) usually collateral, rarely superposed.
- Leaves obviously petiolate, the petioles often slender, rarely as stout as 4 (–5) mm. in diameter, 2–20 mm. long, the blades obtuse to attenuate at base, often long-decurrent on petiole but sometimes decurrent only down to approximate middle of petiole.
- Distal 1–4 internodes of branchlets acutely quadrangular; internodes of inflorescence branches acutely quadrangular; leaves comparatively small, the petioles 2–8 (–10) mm. long, winged nearly to base by the narrowly decurrent leaf blade, the leaf blades (1–)2–10.5 × (0.5–)0.8–4 (–5) cm.; fruits 4–7 mm. in diameter.
- Apex of leaf blades rounded (sometimes retuse) to obtuse or infrequently short-cuspidate, the blades 2–3 times longer than broad; flowers comparatively small, the hypanthium turbinate, 1.5–4 mm. long, 1.5–2.5 mm. in subapical diameter, the stipe 0.2–1 mm. long, the filaments 1–1.5 mm. long, the style 0.5–2 mm. long, caducous, the base only persistent in fruit as a minute umbo; species of forest, ridges, etc., not associated with streams.
- Petioles 3–8 (–10) mm. long; leaf blades obovate to elliptic-obovate, (2–)3–8 × (1–)2–4 (–5) cm.; inflorescences 4–10 cm. long and broad, freely branched, with 50–100 flowers; flowers without anthopodia or these 0.5–2 mm. long. 10. *S. effusum*
- Petioles 3–5 mm. long; leaf blades elliptic-lanceolate, (1–)2–4 × (0.5–)0.8–1.8 cm.; inflorescences comparatively small, (1.5–)2–5 cm. long and broad, with (5–)8–15 flowers; flowers without anthopodia or these slender, 5–10 mm. long. 11. *S. minus*
- Apex of leaf blades gradually narrowed to an obvious acumen 5–12 mm. long, the blades 3–4 times longer than broad, usually 6–10.5 × 1.2–3 cm.; flowers slightly larger, the hypanthium clavate or obconical-clavate, (3–)4–5 mm. long, 2–3 mm. in subapical diameter, the stipe 1–2 mm. long, the filaments 4–8 mm. long, the style 6–9 mm. long, persisting in young fruit but then deciduous; species growing along rivers and streams and frequently with branches and foliage dipping into them. 12. *S. seemannianum*
- Distal internodes of branchlets terete (or distal 1–3 internodes rarely flattened or inconspicuously and bluntly quadrangular); internodes of inflorescence branches terete (or distal ones sometimes slightly flattened or rarely inconspicuously and bluntly quadrangular); leaves in some dimensions larger, the petioles 2–20 mm. long, winged only distally or scarcely to middle, the leaf blades 3.5–14 (–30) × (1.3–)1.5–6 (–10) cm.; fruits 5–10 × 4–8 mm.
- Sepals conspicuous, broadly ovate-semiorbicular, 1–2 mm. long, 2.5–5 mm. broad, narrowly imbricate at basal margins, rounded or broadly obtuse at apex, persistent in fruit; petals copiously glandular-punctate, 3–5 mm. long and broad; filaments 7–12 mm. long at anthesis, the anthers 0.7–0.9 mm. long; style 7–12 mm. long at anthesis, persistent in young fruit, at length deciduous; petioles 2–7 mm. long; leaf blades thin-coriaceous, elliptic or ovate-elliptic, 3.5–14 × 1.5–6 cm., broadly to slenderly acuminate (tip 5–12 mm. long), the principal secondary nerves 12–25 per side, 1.5–4 mm. apart, obvious and usually sharply prominulous on both surfaces; flowers each on an anthopodium 2–7 mm. long. 13. *S. curvistylum*

Sepals comparatively inconspicuous, broadly ovate-deltoid, 0.2-1 mm. long, 1-4 mm. broad, not imbricate at basal margins, obtuse to rounded at apex, caducous in fruit or only fragments remaining; petals not or inconspicuously glandular-punctate; filaments 2-8 mm. long at anthesis, the anthers 0.3-0.5 mm. long; style 3-7 mm. long at anthesis, caducous or the base sometimes persisting in young fruit as a minute umbo; petioles 4-20 mm. long.

Leaf blades chartaceous to thin-coriaceous, 4.5-10.5 × (1.5-) 2-5.5 cm., about twice as long as broad, abruptly acuminate to a slender tip 5-20 mm. long, the principal secondary nerves slightly elevated or prominulous on both surfaces, the (inner) collecting nerve obvious, 1-3 mm. from margin; hypanthium 3-5 mm. long, 2-3.5 mm. in subapical diameter, the stipe 0.5-2 mm. long.

Principal secondary nerves (those connected by loops of the inner collecting nerve) of leaf blades 12-25 per side, 2-7 mm. apart, spreading, the (inner) connecting nerve 1-3 mm. from margin (even in basal part of blade), an outer collecting nerve present, usually obvious, a third (outermost) collecting nerve sometimes apparent but usually obscure or incomplete, the veinlet reticulation (including straight tertiary nerves between principal secondaries) copious and prominulous on both surfaces, forming oblique areoles subparallel to secondary nerves; leaf blade acumen comparatively broad, 2.5-6 mm. broad 10 mm. from apex; inflorescences often extended-decompound, 5-17 × 5-25 cm.; apparently mature fruit with a thin, brittle pericarp, oblong-obovoid, 8-10 × 5-6 mm., obtuse at base, narrowed into a terete hypanthial rim 1-2 mm. long and 2-3 mm. in diameter, the cupuliform disk about 1 mm. deep, the cotyledons superposed. 14. *S. fijiense*

Principal secondary nerves (those connected by loops of the inner collecting nerve) of leaf blades 5-7 per side, 5-9 mm. apart, curved-subascending, the (inner) collecting nerve 2-5 mm. from margin (in basal part of blade 4-7 mm. from margin), an outer collecting nerve obvious, a third (outermost) collecting nerve usually apparent, the veinlet reticulation (including irregular tertiary nerves between secondaries) lax, slightly prominulous or nearly plane above, prominulous beneath, forming irregular areoles without obvious orientation to secondary nerves; leaf blade acumen very slender, 1.5-2 mm. broad 10 mm. from apex; inflorescences (as far as available) more compact, 5-9 × 4-7 cm.

15. *S. phaeophyllum*

Leaf blades coriaceous, opaque, (4-) 5-25 (-30) × (1.3-) 2-8 (-10) cm., about three times as long as broad, gradually narrowed to an obtuse to narrowly subdeltoid tip 5-15 mm. long, the principal secondary nerves 10-20 per side, immersed or faintly impressed above, prominulous beneath, the veinlet reticulation often obscure, immersed above, faintly or sometimes obviously prominulous beneath, the (inner) collecting nerve inconspicuous or apparent, 0.5-5 (-8) mm. from margin; hypanthium 2.5-7 mm. long, 2-5 mm. in subapical diameter, the stipe 1-4 (-5) mm. long.

Petioles (3-) 5-12 mm. long, 1-2 mm. in diameter; leaf blades elliptic to elliptic-lanceolate, (4-) 5-14 × (1.3-) 2-4.5 cm., acute to attenuate at base, gradually short-acuminate at apex (acumen narrowly subdeltoid, 5-15 mm. long), the principal secondary nerves 3-5 mm. apart, the (inner) collecting nerve 0.5-2 mm. from margin, an outer collecting nerve usually visible but inconspicuous; style 3-5 mm. long. 16. *S. rubescens*

Petioles 4-20 mm. long, 1-4 (-5) mm. in diameter; leaf blades elliptic-oblong to oblong-lanceolate, 7-25 (-30) × (2-) 3-8 (-10) cm., attenuate to obtuse at base, obtuse to bluntly short-cuspidate at apex (acumen if present as broad as long), the principal secondary nerves 3-15 (-20) mm. apart, the (inner) collecting nerve 1-5 (-8) mm. from margin, an outer (and sometimes a third) collecting nerve apparent and usually interconnected by obvious veinlet reticulation; style 5-7 mm. long. 17. *S. amicorum*

Leaves sessile to short-petiolate, the petioles if present stout (3-6 mm. in diameter), not longer than 7 mm., the blades cordate to subrounded at base, sometimes amplexicaul, not or very shortly and abruptly decurrent on petiole, rounded to obtusely short-acuminate at apex, the finer venation subimmersed at least on upper surface, infrequently prominulous beneath; sepals inconspicuous; petals 3-4 mm. in diameter.

Leaves subsessile to short-petiolate, the petioles 1-7 mm. long, the blades usually thick-coriaceous, elliptic- or ovate- to obovate-oblong, (6-) 8-33 (-45) × (2.5-) 5-11.5 (-16) cm., shallowly cordate to subrounded at base, not amplexicaul, rounded to obtuse, short-cuspidate, or obtusely short-acuminate at apex (acumen, if present, as broad as long), the principal secondary nerves 10-30 per side, 4-20 mm. apart, strongly elevated beneath, the (inner) collecting nerve 2-12 mm. from margin, undulate and often irregular, a second and third collecting nerve often apparent; inflorescences very variable, (4-) 6-15 × (3-) 4-20 cm., usually with many (10-400) flowers; style 7-10 mm. long. 18. *S. grayi*

- Leaves sessile, the petioles not discernible, the blades coriaceous, lanceolate- to ovate-oblong, 6-17 × 2.5-5 cm., cordate and amplexicaul at base, short-cuspidate to obtusely acuminate at apex (acumen deltoid-oblong, to 13 mm. long), the principal secondary nerves 15-18 per side, 3-10 mm. apart, faintly or obviously prominulous beneath, the (inner) collecting nerve 1.5-3 mm. from margin, slightly undulate; inflorescences small, 1.5-2.5 cm. long and broad, with 15-20 flowers; style about 15 mm. long. 19. *S. simillimum*
- Flowers comparatively large, the hypanthium obconical to subtrubinate or oblong-infundibular, 5-10 mm. long at anthesis and 4-7 mm. in subapical diameter, gradually narrowed proximally into a stout stipe 2-5 mm. long, the hypanthial rim thick, the disk deeply cupuliform, 2-4 mm. deep; sepals broadly deltoid, 1.3-2 × 3-5 mm., obtuse, not imbricate at basal margins, long-persistent on fruits; petals suborbicular, 5-8 mm. in diameter, imbricate and calyprate or rarely one or two persisting at anthesis; stamens with filaments 8-18 mm. long and anthers 0.5-1 mm. long; style (6-) 10-18 mm. long at anthesis; inflorescences compact, not more than 10 cm. in length and breadth; fruits becoming large, up to 29 × 17 mm., the pericarp drying thick-coriaceous, the cotyledons corneous, superposed; leaves with petioles to 18 mm. long and blades not more than 10 × 5.5 cm., the venation often close and prominulous.
- Distal internodes of branchlets sometimes flattened or all branchlets terete; petioles (3.5-) 5-15 mm. long, slender, about 1 mm. in diameter near base, inconspicuously winged in the distal 1/4-1/3 by the decurrent leaf blade base; leaf blades thin-coriaceous, very slightly recurved at margin, ovate to lanceolate, (4-) 4.5-7 × 1.5-3.5 cm., abruptly attenuate at base and short-decurrent on petiole, abruptly acuminate or obviously cuspidate at apex (acumen 4-15 mm. long, longer than broad, often 2-4 mm. broad 10 mm. from the subacute apex); flowers without anthodia or these sometimes present and up to 1 mm. long; fruits at maturity ovoid-ellipsoid, rounded at base, truncate at apex. 20. *S. nidie*
- Distal internodes of branchlets sometimes sharply quadrangular or all branchlets terete; petioles 5-18 mm. long, slightly stouter, 1-2 mm. in diameter near base, conspicuously winged nearly to base or at least in the distal half by the decurrent leaf blade base; leaf blades coriaceous to thick-coriaceous, sharply but narrowly recurved at margin, elliptic to subrhombic or obovate-elliptic, (2.5-) 3.5-10 × (1-) 1.8-5.5 cm., gradually attenuate at base and broadly long-attenuate on petiole, abruptly short-acuminate or inconspicuously cuspidate at apex (acumen 2-5 mm. long, as broad as or broader than long, the actual tip broadly obtuse); flowers apparently always without anthodia; fruits at maturity pyriform, abruptly tapering proximally into a stout stipe 5-8 mm. long, rounded at apex. 21. *S. leucanthum*

GROUP 3

- Inflorescences essentially capitate, terminal, axillary, or borne on branchlets below leaves, the inflorescence branches forming a glomerulate axis, the flowers 3-10 (sometimes solitary or paired), congested, large, presumably (not completely known for sp. 23) 7-10 cm. across expanded stamens; hypanthium large, up to 35 mm. long and 20 mm. in subapical diameter, cylindrical-infundibular to elongate-obconical, the spreading rim 4-8 mm. long and bearing many (perhaps 1,000 or more) crowded stamens on its upper (inner) surface, the sepals 7-15 × 12-23 mm., (accrescent to 20 × 25 mm. in fruit), the petals (not known for sp. 23) 15-23 mm. in diameter; fruits large, ovoid, at least 6 cm. long at maturity, the seeds with collateral cotyledons; robust, indigenous plants with leaf blades up to 90 cm. long, the base narrowly rounded to cordate, sometimes amplexicaul, the petioles stout, 1-7 mm. long.
- Hypanthium 10-14-costate at anthesis, usually 12-23 × 7-17 mm., the ribs obvious, extending upward into sepals; fruits costate, up to 7.5 × 6 cm. (as far as recorded); petioles 2-5 mm. in diameter; leaf blades elongate-oblong or elliptic-lanceolate, 10-45 × 2-13 cm., with 12-25 principal secondary nerves. 22. *S. neurocalyx*
- Hypanthium smooth at anthesis, up to 35 × 20 mm.; fruits smooth, up to 10 × 8.5 cm.; petioles more robust, up to 7 mm. in diameter; leaf blades oblong, 27-90 × 8-30 cm., with 20-35 principal secondary nerves. 23. *S. amplifolium*
- Inflorescences obviously branched, the flowers (1.5-) 3-9 cm. across expanded stamens; hypanthium not exceeding 22 × 14 mm., the rim to 3 mm. long and bearing up to several hundred stamens, the sepals not more than 8 × 12 mm., the petals (5-) 7-20 mm. in diameter; leaf blades not exceeding 38 cm. in length.
- Flowers 1-7 (-15) per inflorescence, always borne on conspicuous, slender anthodia (4-) 7-90 mm. long, often becoming dependent, the inflorescences usually obviously longer than broad, (5-) 8-30 cm. long, not more than 12 cm. broad, terminal or axillary, usually with few, very slender, elongate, terete branches; hypanthium 8-13 mm. long and broad, gradually narrowed to a stipe 1-5 mm. long but becoming obtuse to subrounded at base at anthesis; fruits subglobose to obovoid- or ellipsoid-urceolate, 2-5 cm. in diameter; leaves subsessile, the slender petioles 1-5 mm. long, the blades chartaceous to submembranaceous, oblong- to ovate- or elliptic-lanceolate, (4-) 6-21 × (1.5-) 2-6.5 cm., narrowly cordate (sometimes amplexicaul) to broadly obtuse at base, long-acute to gradually acuminate at apex; indigenous. 24. *S. gracilipes*

Flowers 10-50 or more per inflorescence in indigenous species (sometimes as few as 3 in some introduced species), with anthopodia if present infrequently as long as 7 mm., not dependent, the inflorescences usually about as broad as long, with comparatively stout and short internodes.

Leaf blades proportionately broad (about twice as long as broad), cordate or rounded at base (or, if obtuse or acute, then abruptly decurrent on petiole, this rarely as long as 18 mm.).

Hypanthium turbinate to obconical, 7-15 mm. long, 6-12 mm. in subapical diameter, gradually narrowed to an obtuse base, not stipitate, the anthopodia lacking or to 3 mm. long; inflorescences terminal or axillary, spreading, 4-15 cm. long and broad, with 10-50 flowers, these large, 5-9 cm. across expanded stamens; fruits globose to broadly ovoid, at maturity about 3 cm. in diameter; leaf blades cordate to rounded at base, obtuse to broadly obtuse at apex, (10-) 13-30 × 5-17 cm., the petioles 6-18 mm. long, robust (3-5 mm. in diameter); indigenous and usually littoral, not occurring much above sea level. 25. *S. richii*

Hypanthium infundibular, 11-20 mm. long, 8-12 mm. in subapical diameter, conspicuously or abruptly narrowed into a basal stipe 2-8 mm. long; inflorescences not widespreading, with 5-15 (-30) flowers, these not more than 7 cm. across expanded stamens; fruits pyriform to ellipsoid, at maturity 3.5-8 (-15) × 4-6 (-8) cm.; petioles 2-4 mm. in diameter; leaf blades obtuse to acute or broadly acuminate at apex; cultivated or naturalized species.

Leaves often subsessile, the petioles 1-7 mm. long, the blades (6-) 10-25 × (4-) 5-12 cm., cordate to rounded at base, or if obtuse then abruptly decurrent on petiole; inflorescences terminal, axillary, or in axils of fallen leaves; flowers 3-5 cm. across expanded stamens, the anthopodia if present to 13 mm. long, the petals and filaments white; cultivated only.

26. *S. samarangense*

Leaves with petioles 8-15 mm. long, the blades (10-) 16-38 × (5-) 8-22 cm., obtuse to acute at base and abruptly decurrent on petiole, infrequently rounded; inflorescences borne on defoliate branchlets, branches, or trunks, infrequently axillary; flowers 4-7 cm. across expanded stamens, the anthopodia if present to 4 mm. long, the petals and filaments red to pink (infrequently white); a thoroughly naturalized aboriginal introduction.

27. *S. malaccense*

Leaf blades proportionately narrow (usually 3, rarely 2.5, or more times as long as broad); plants never cauliflorous, seldom ramiflorous.

Base of leaf blades narrowly cordate or rounded to obtuse (or, if acute or subacute, then abruptly or shortly decurrent on petiole and this rarely as long as 15 mm.); leaf blades oblong-elliptic to oblong- or ovate- or obovate-lanceolate, (5-) 10-27 × (2-) 4-9.5 cm., obtuse to acute or gradually short-acuminate at apex; fruits ellipsoid to subglobose, at maturity 2.5-3.5 cm. in diameter; indigenous species.

Hypanthium turbinate to campanulate-obconical, at anthesis or in advanced bud 10-18 × 10-14 mm., gradually narrowed proximally to an obtuse or rounded base, the sepals 2-5 × 8-10 mm.; filaments free or loosely coherent at base into temporary phalanges; flowers without anthopodia or these to 5 mm. long. 28. *S. quadrangulatum*

Hypanthium infundibular, at anthesis or in advanced bud 12-20 × 6-14 mm., tapering proximally into a stipe 1.5-4 mm. long, the sepals 3-9 × 6-10 mm.; filaments loosely coherent into sometimes persistent phalanges; flowers without anthopodia or these to 13 mm. long.

29. *S. nandarivatense*

Base of leaf blades acute or cuneate to attenuate and obviously decurrent on petiole.

Hypanthium turbinate to infundibular, tapering toward base, the sepals 2-6 × 6-12 mm.; petals at least 10 × 7 mm.; flowers at anthesis at least 4 cm. across expanded stamens, the filaments 20-40 mm. long; fruits subglobose to ovoid or pyriform, nearly as broad as long.

Petioles 10-35 mm. long; leaf blades about 3 times as long as broad; flowers without anthopodia or these up to 5 mm. long, the hypanthium turbinate, gradually tapering proximally and without a well-demarcated stipe, the sepals 2-5 × 5-8 mm., the petals apparently not more than 12 mm. in diameter, the style 20-30 mm. long; fruits not more than 2.5 cm. in diameter; indigenous species.

Leaves opposite, the blades coriaceous, lanceolate to elliptic, 16-32 × 4-12 cm., acute to obtuse and minutely callose-apiculate at apex, the principal secondary nerves 13-20 per side, the petioles 20-35 mm. long, robust (3-5 mm. in diameter). ... 30. *S. gillespiei*

Leaves opposite or ternate, the blades chartaceous, oblong, (5.5-) 11-14 × (1.5-) 3-4.5 cm., rounded to obtuse or minutely cuspidate at apex, the principal secondary nerves 6-10 per side, the petioles 10-25 mm. long, comparatively slender (about 2 mm. in diameter).

31. *S. tetrapleurum*

Petioles short, 5-8 mm. long; leaf blades lanceolate, 9-22 × 1.5-6.5 cm., 3-4.5 times as long as broad, gradually tapering to a long-acuminate apex; flowers borne singly on anthopodia 5-10 mm. long, the hypanthium infundibular, abruptly tapering proximally into a stipe 3-4

mm. long, the sepals 5-6 × 8-12 mm., the petals 12-20 × 10-18 mm., the style 40-50 mm. long; fresh fruits up to 4 cm. in diameter; cultivated and occasionally naturalized.

32. *S. jambos*

Hypanthium cylindrical, at anthesis 10-15 mm. long and 6-8 mm. in subapical diameter, rounded at base, the sepals small, about 2 × 2-4 mm.; petals small, free but early caducous; flowers at anthesis less than 2 cm. across expanded stamens, the filaments 3-7 mm. long; fruits oblong-to ellipsoid-obovoid, to 3 cm. long, about twice as long as broad; leaves with petioles (10-) 20-30 mm. long, the blades elliptic to obovate-oblong or oblanceolate, 6-14 × 2.5-6.5 cm., attenuate at base and long-decurrent on petiole; the commercial clove, sparingly cultivated.

33. *S. aromaticum*

1. *Syzygium wolfii* (Gillespie) Merr. & Perry in *Sargentia* 1: 75. 1942; Perry in *J. Arnold Arb.* 31: 353. 1950; *J. W. Parham, Pl. Fiji Isl.* 142. 1964, ed. 2. 204. 1972.

Eugenia wolfii Gillespie in *Bishop Mus. Bull.* 83: 22. fig. 28. 1931; A. C. Sm. in op. cit. 141: 106. 1936.

Tree 7-20 m. high, sometimes slender, occurring at elevations of 100-1,127 m. in dense or secondary forest, in patches of forest in open country, or in crest-forest; distal internodes of branchlets sharply triquetrous, (5-) 10-15 mm. in diameter, becoming bluntly triquetrous to subterete, bearing large, coriaceous, deltoid bracts like those subtending inflorescences; leaves ternate at slightly swollen nodes, sessile or petiolate, the petiole 10 mm. long and (8-) 10-14 mm. thick, winged or sharply angled to base, leaving conspicuously obdeltoid scars; leaf blades thick-coriaceous, copiously subimmersed-glandular, obovate, (25-) 27-45 cm. long, (9-) 11-21 cm. broad, gradually narrowed proximally and decurrent on petiole or on branchlet, broadly retuse-rounded or abruptly and broadly cuspidate at apex (tip if present to 7 × 10 mm.), the costa very stout, 5-10 mm. thick, flattened to slightly convex above, sharply carinate beneath, the principal secondary nerves (those joined to loops in collecting nerve) 30-40 per side, (4-) 5-15 mm. apart, straight, spreading, subparallelled by less obvious intermediate tertiaries, impressed above or sharply prominulous in blunt depressions, prominent beneath (least obvious in type collection), the (inner) collecting nerve very obvious (except in type collection) and slightly undulate, 5-8 mm. within margin, a secondary collecting nerve apparent but less obvious, a third collecting nerve sometimes visible very near the subscariose blade margin, the veinlet reticulation obscure, forming subquadrangular or irregular areoles subparallel to secondaries; inflorescences terminal, congested-trichotomous-cymose, freely branched, many-flowered (flowers up to 100 or more), branching from base, 10-14 cm. long and broad, the central branch the stoutest (often 8 mm. in diameter and triquetrous in lower internodes), the other branches and branchlets robust, subcomplanate, the entire inflorescence basally subtended by conspicuous imbricate bracts, these coriaceous, elongate-deltoid, acute, 20-30 mm. long and 10-16 mm. broad at base, eventually deciduous, the branchlet-subtending bracts deltoid-ovate, acute to obtuse, 5-7 × 6-10 mm., persistent, decreasing in size distally; flowers without anthopodia, solitary, each subtended by 4-6 imbricate, amplexant bracteoles as small as 3 × 5 mm. (i. e. the ultimate inflorescence branchlet internodes essentially lacking); hypanthium thick-coriaceous, terete, campanulate-cylindric, 5-7 mm. long and in subapical diameter, the base obtuse to rounded, the suberect rim 1-2 mm. long, the disk deeply cupuliform and about 2 mm. deep; sepals 4, depressed-ovate-semiorbicular, 1-1.5 mm. long, 5-7 mm. broad, narrowly imbricate at basal margins, broadly rounded at apex, persistent; petals 4, copiously and minutely immersed-glandular except toward scariose margin, suborbicular, 3-4 mm. long and broad, coherent into a calyptra; stamens apparently 2-seriate and about 50-100 in number, the filaments 6-8 mm. long, free to base or loosely coherent in temporary phalanges, the anthers ellipsoid, 0.5-0.7 mm. long; style 5-7 mm. long, persistent after anthesis; very young fruits similar to hypanthia but slightly enlarged, thick-coriaceous in drying, pink to deep purple. Young flowers were obtained in May and December, old flowers in December, and young fruits in both May and December.

TYPIFICATION: The type is *Gillespie 4290* (BISH HOLOTYPE), collected Dec. 13, 1927, on the summit of Mt. Nanggaranambuluta, east of Nandarivatu, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and known only from the two largest islands. The only collection known from Viti Levu is the type.

LOCAL NAMES: *Yasiyasi*, *ndoko ni vundi* (Mathuata).

AVAILABLE COLLECTIONS: VANUA LEVU: MBUA: Without further locality, *Horne 1100*. MATHUATA: Between Nanduna River and Mt. Ndelanathau, divide between Wainunu and Ndreketi Rivers, *Smith 1854*; Seangangga Plateau, in drainage of Korovuli River, vicinity of Natua, *Smith 6877*, *Berry 8*. THAKAUNDRIVE: Navonu Creek, Natewa Peninsula, *DA 15067*.

Syzygium wolfii has become much better known through the Vanua Levu collections listed above; these are very uniform and superficially differ from the type collection in being somewhat more robust, the leaf blades with more obvious venation. Gillespie's collection provided flower buds and young fruits, but his description failed to emphasize all the remarkable features of the species; therefore a new description seems suitable. The only mature flowers, found on *Smith 6877*, are past anthesis and not too satisfactory. The Vanua Levu material is known from elevations of 300 m. or less (whereas the type was obtained on a Viti Levu summit at 1,127 m.).

Such features as the stout, triquetrous branchlets, the strongly triquetrous petioles (or essentially sessile leaf costae) and their conspicuous, obdeltoid, ternate scars, the extremely large, thick-coriaceous leaf blades with sharply carinate costae leading into the branchlet angles, the elongate-deltoid bracts covering the distal branchlet internodes and inflorescence bases, and the robust, triquetrous main inflorescence axis have not been otherwise noted by me in *Syzygium*. In basic inflorescence characters *S. wolfii* seems well placed as a (distant) relative of *S. brackenridgei* and its close allies. None of the Papuan species treated by Hartley and Perry (1973) seem to suggest this Fijian endemic. However, the leaves of *S. wolfii* are surprisingly suggestive of those of *Cleistocalyx decussatus* (discussed in the following genus in this treatment). Characters that may be used to recognize the two species when sterile are discussed under the latter species.

2. *Syzygium brackenridgei* (A. Gray) C. Muell. in Walp. Ann. Bot. Syst. 4: 838. 1858; Merr. & Perry in Sargentia 1: 75. 1942; Perry in J. Arnold Arb. 31: 353. 1950.

FIGURES 52, 53A & B, 54A.

Eugenia brackenridgei A. Gray, Bot. U. S. Expl. Exped. 1: 521. 1854, Atlas, pl. 61, A. 1856; Seem. Viti, 436. 1862, Fl. Vit. 79. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 169. 1890.

Eugenia brackenridgei A. Gray ex Seem. in Bonplandia 9: 256. 1861.

Jambosa brackenridgei Brongn. & Gris in Bull. Soc. Bot. France 12: 181. 1865.

Pareugenia imthurnii Turrill in Hook. Icon. Pl. 31: t. 3004 (Jan.) 1915, in J. Linn. Soc. Bot. 43: 21. (May) 1915.

Pareugenia brackenridgei A. C. Sm. in Bishop Mus. Bull. 141: 109. 1936.

Syzygium imthurnii Merr. & Perry in Sargentia 1: 75. 1942.

Syzygium brackenridgei var. *brackenridgei*; J. W. Parham, Pl. Fiji Isl. 138. 1964, ed. 2. 199. 1972.

Tree 3–20 m. high, found at elevations of about 50–1,150 m. in usually dense forest, in patches of forest in open areas, and on crests in thickets. The hypanthium is pale green and pink-tinged, becoming rich pink to purple in fruit; the petals are white and pink-tinged or entirely pink; the filaments are white; and the anthers, disk, and style are pale yellow. Flowering material has been collected between July and January; fruits, which appear merely as enlarged and somewhat succulent hypanthia, are found a few months later than flowers.



FIGURE 52. *Syzygium brackenridgei*, from Smith 8847; a flowering branchlet from Namosi Province, Viti Levu, \times about 2/3.

TYPIFICATION AND NOMENCLATURE: The type of *Eugenia brackenridgei* is *U. S. Expl. Exped.* (US 47771 HOLOTYPE; ISOTYPE at GH), collected in 1840 on the island of Ovalau. *Pareugenia imthurnii* is typified by *im Thurn* 262 (K HOLOTYPE composed of 3 sheets), collected Nov. 21, 1906, in the vicinity of Nandarivatu, Mba Province, Viti Levu. As concluded by Perry (1950), no consequential characters separate the two collections.

DISTRIBUTION: Fiji and Tonga; in Fiji the species is frequent on Viti Levu and is also known from Kandavu and Ovalau; some 45 collections have been examined. It was recorded by Yuncker (in Bishop Mus. Bull. **178**: 90. 1943) as being represented on Niue by his no. 9816; this collection represents *Syzygium dealatum* (Burkill) A. C. Sm., which is common on Niue as well as in Tonga and Samoa. *Syzygium brackenridgei* does not occur on Niue, but it is present in Tonga, although I find no previous published record: 'Eua: Parks 16187, 16222, Hotta 5503 (all BISH); it also occurs on Kao and Vava'u (W. R. Sykes, in litt.).

LOCAL NAMES AND USE: Names used for this species on Viti Levu are *songasonga* (or *songosongo*) and *kavika ngangá*; very questionable names are *mbarewai* (Mba) and *ndanundanú* (Nandronga & Navosa). The tree produces strong wood that is sometimes used for poles in house-building, but the species is not considered to produce a commercially valuable timber.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mountains near Lautoka, Greenwood 36; Koro-O road, west of Nandarivatu, DA 13531; vicinity of Nandarivatu, Gillespie 4193. NANDRONGA & NAVOSA: Northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, Smith 5443. SERUA: Inland from Korovisilou, DF 412 (Damanu 84). NAMOSI: Valley of Wainambua Creek, south of Mt. Naitarandamu, Smith 8847; vicinity of Namosi, Seemann 155. RA: Vicinity of Naivotho, Berry 278. NAITASIRI:

Vicinity of Matawailevu, Wainimala River, *St. John 18208*; Waimanu River, *DA 15582*. REWA: Na Vasi, *Horne 689*. KANDAVU: Mt. Mbuke Levu, *Smith 239*. OVALAU: Lovoni Valley, *Horne 251*; summit and adjacent slopes of Mt. Korotlutolu, west of Thawathi, *Smith 8034*.

3. *Syzygium dubium* (Perry) A. C. Sm., comb. et stat. nov. FIGURES 53C-E, 54B.

Syzygium brackenridgei var. *dubium* Perry in *J. Arnold Arb.* 31: 354. 1950; *J. W. Parham, Pl. Fiji Isl.* 138. 1964, ed. 2. 199. 1972.

Tree 4-8 m. high, often slender, found from near sea level to 590 m. in dense or thin forest or in forest patches in open country. The hypanthium is pink to red, becoming rich purple in fruit; the petals are cream-white to pink and red-tinged; and the filaments are white to rich pink, the anthers yellow. Flowers have been collected between May and July, fruits between July and December.

TYPIFICATION: The type, a collection in young fruit, is *Smith 6524* (A HOLOTYPE; many ISOTYPES), obtained Nov. 6, 1947, on the summit ridge of Mt. Numbuiloa, east of Lambasa, Mathuata Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji, and thus far known only from Vanua Levu.

AVAILABLE COLLECTIONS: VANUA LEVU: MBUA: Lower Wainunu River valley, *Smith 1723*; Mbua without further locality, *Horne*, Sept., 1878. MATHUATA: Between Nanduna River and Mt. Ndelanathau, divide between Wainunu and Ndreketi Rivers, *Smith 1840*; Seangangga Plateau, in drainage of Korovuli River, vicinity of Natua, *Smith 6738*; Seangangga region, *DA 11907*; Seangangga Farm, *DA 13496*.

Perry contrasted her new variety with typical *Syzygium brackenridgei* because of its oblong leaves and slightly larger flowers. In fact, the leaves are substantially more robust than those of *S. brackenridgei* as to petioles and larger blades with more numerous secondary nerves; the hypanthium is notably larger (cf. FIGURES 54A and B); and the stamens are more numerous, with filaments aggregated into thick-carnose phalanges (cf. FIGURES 53A and E). On the basis of presently available collections, *S. brackenridgei* does not occur on Vanua Levu, while its relative has been obtained only there, suggesting that a separation at the specific level is reasonable.

4. *Syzygium oblongifolium* (Gillespie) Merr. & Perry in *Sargentia* 1: 75. 1942; Perry in *J. Arnold Arb.* 31: 355. 1950; *J. W. Parham, Pl. Fiji Isl.* 142. 1964, ed. 2. 203. 1972.

FIGURE 54C & D.

Pareugenia oblongifolia Gillespie in *Bishop Mus. Bull.* 83: 23, fig. 29. 1931.

Tree 2-15 m. high, known to occur in usually dense forest from near sea level to an elevation of 850 m. The petals have been noted as pure white to pink, the filaments as greenish white, and the disk and style also as white. Flowers have been obtained between July and October, fruits only in September.

TYPIFICATION: The type is *Gillespie 3268* (BISH HOLOTYPE; ISOTYPE at UC), collected Oct. 2, 1927, near the summit of Mt. Vakarongasiu, Namosi Province, Viti Levu.

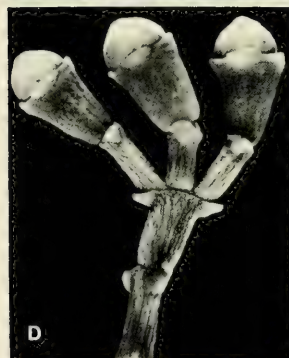
DISTRIBUTION: Endemic to Fiji and thus far known only from Viti Levu.

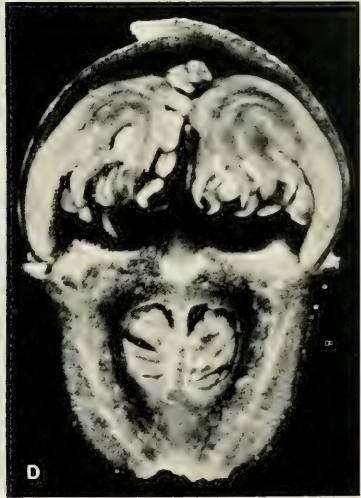
LOCAL NAME AND USE: *Kavika ni yalu* (*Smith 5420*); the tree is sometimes used for timber but not on a commercial scale.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 1205*; hills between Nggaliwana and Tumbindreketi Creeks, east of the sawmill at Navai, *Smith 5897*. NANDRONGA & NAVOSA: Northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, *Smith 5420*. NAITASIRE: Lower Wainunu River, *DA L.13284, L.13293* (coll. *Berry*). TAILEVU: Vicinity of Ngegendamu, *DA 8588*.

In addition to the cited specimens, five others were here referred in preliminary identifications but are not currently available; differences between *Syzygium oblongi-*

FIGURE 53. A & B, *Syzygium brackenridgei*; A, adaxial surface of staminal phalanges, $\times 8$; B, triad of flowers just before anthesis, $\times 2$. C-E, *Syzygium dubium*; C, distal portion of branchlet, with foliage and an inflorescence, $\times 1/4$; D, triad of flowers just before anthesis, $\times 2$; E, adaxial surface of staminal phalanges, $\times 8$. A & B from *Smith 8847*. C-E from *Smith 1723*.





folium and *S. brackenridgei* are such that careful examination of a flower or fruit is required to distinguish them. Leaves of the two species are quite similar, but their flowers seem very different (cf. FIGURES 53A, 54 A, C, and D). In *S. oblongifolium* the hypanthial rim is extremely short and the disk is essentially flat and thick-carnose; the filaments are united into distinct phalanges for about half their length; and the style is only 2–2.5 mm. long. In *S. brackenridgei* the hypanthial rim is very obvious and the comparatively thin disk is distinctly cupuliform; the filaments are only proximally united into phalanges; and the style is twice as long as that of its relative.

5. *Syzygium confertiflorum* (A. Gray) C. Muell. in Walp. Ann. Bot. Syst. 4: 838, as *S. confertiflora*. 1858; Perry in J. Arnold Arb. 31: 355. 1950; J. W. Parham, Pl. Fiji Isl. 138. 1964, ed. 2. 199. 1972.

Eugenia confertiflora A. Gray, Bot. U. S. Expl. Exped. 1: 523. 1854, Atlas, pl. 61, B. 1856; Seem. Viti, 436. 1862, Fl. Vit. 79. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 169. 1890; A. C. Sm. in Bishop Mus. Bull. 141: 105. 1936.

Tree 3–30 m. high, recorded as slender or dense-foliaged, occurring in usually dense forest at elevations from near sea level to about 500 m. Fully mature flower are infrequently noted, but the hypanthium is reddish and the petals white. Flowers shown in the original illustration are close to anthesis, and in this condition they have been obtained between May and August.

TYPE: The type is *U. S. Expl. Exped.* (US 47774 HOLOTYPE; ISOTYPES at GH, K), collected in 1840 on the island of Ovalau.

DISTRIBUTION: Endemic to Fiji but not common; thus far known from five of the islands.

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Na Vasi, *Horne 702*; Mt. Korombamba, *DA 16502*. OVALAU: Hills west of Lovoni Valley, on ridge south of Mt. Korolevu, *Smith 7628*. MAKONGAI: *Tothill*, Jan., 1926. NGAU: Hills east of Herald Bay, inland from Sawaieke, *Smith 7758*. VANUA LEVU: MBUA: Without further locality, *Horne 1056*. THAKAUDROVE: Mt. Kasi, Yanawai River region, *Smith 1757, 1797*.

In 1936 (cited above) I erroneously discussed this species as closely related to *Eugenia effusa* (to which my 1821, one of the cited numbers, belongs); in fact the two species have little in common other than their small, blunt leaf blades. As well shown in Gray's illustration, *Syzygium confertiflorum* differs from its closest relative, *S. brackenridgei*, in the reduced size of all its parts. Its stamens are many fewer and, in my observation, have free filaments. The New Hebridean *S. nomoa* Guillaumin (in J. Arnold Arb. 12: 258. 1931) resembles *S. confertiflorum* in many respects, but it has slightly larger leaves and substantially larger flowers, with the hypanthium more definitely narrowed proximally, and with more numerous stamens apparently coherent into phalanges. It seems somewhat intermediate between *S. confertiflorum* and *S. brackenridgei* but is readily separable from both.

6. *Syzygium cumini* (L.) Skeels in U. S. Dept. Agr. Pl. Industr. Bull. 248: 25. 1912; Alston in Trimen, Handb. Fl. Ceylon 6: 116. 1931; Merr. & Perry in J. Arnold Arb. 19: 108, 230. 1938; Perry in op. cit. 31: 357. 1950; Yuncker in Bishop Mus. Bull. 220: 202. 1959; J. W. Parham, Pl. Fiji Isl. 138. 1964, ed. 2. 199. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 134. 1970; Schmid in Bot. Jahrb. 92: 454, fig. 30–40. 1972; P. Ashton in Rev. Handb. Fl. Ceylon 2: 443. 1981.

FIGURE 54. A, *Syzygium brackenridgei*: longitudinal section of flower just before anthesis, $\times 8$. B, *Syzygium dubium*: longitudinal section of flower just before anthesis, $\times 8$. C & D, *Syzygium oblongifolium*: C, flower past anthesis, showing cushionlike disk, style, and a few persistent staminal phalanges, $\times 8$; D, longitudinal section of flower just before anthesis, $\times 8$. A from *Smith 8034*, B from *Smith 1723*, C & D from *Gillespie 3268*.

Myrtus cumini L. Sp. Pl. 471. 1753.

Eugenia jambolana Lam. Encycl. Méth. Bot. 3: 198. 1789; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 100. 1948.

Syzygium jambolanum DC. Prodr. 3: 259. 1828.

Eugenia cumini Druce in Bot. Exch. Club Soc. Brit. Isles 3: 418. 1914; Merr. Interpret. Rumph. Herb. Amb. 394. 1917.

Tree to 10 m. high (to 25 m. where indigenous), cultivated near sea level or perhaps rarely naturalized in forest. The hypanthium is orange-tinged, the petals and filaments are white, and the fruits when mature turn dark red or purple. In Fiji flowers and fruits have been found in months scattered throughout the year.

TYPIFICATION AND NOMENCLATURE: *Myrtus cumini* is based entirely on material from Ceylon: *Hermann* (BM HOLOTYPE); *Eugenia jambolana* on *Jambolana* Rumph. Herb. Amb. 1: 131. t. 42. 1741. The specific epithet of the *jambolan* has sometimes been erroneously spelled *cuminii* (e. g. Ochse et al., Trop. and Subtrop. Agr. 1: 674. 1961; Purseglove, Trop. Crops, Dicot. 401. 1968, where it is unaccountably said to be a native of Brazil). The species was not named after an individual and therefore the epithet is not governed by ICBN, Art. 73.10; Linnaeus may have intended an allusion to the spicy, seedlike fruit of *Cuminum cyminum* L. (Apiaceae).

DISTRIBUTION: India and Ceylon eastward to Malesia; a precise place of origin is uncertain, as the species may have become naturalized in much of its putative indigenous range. It is now in widespread tropical cultivation.

LOCAL NAMES AND USES: *Jambolan*, *Java plum*, *kavika ni India*, *jammun* (Hindi), *jaman* (Hindi). The somewhat astringent fruits are edible but are usually used for making into preserves. In some areas the heavy timber is considered useful for construction. Several forms (cultivars?) are said to occur in Malesia, including one that is seedless.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Waindrandra Creek, DA 3406; Prince's Road, DA 188; Adi Cakombau School, Sawani, DA 7608; Principal Agricultural Station, Koronivia, DA 6021, 10523, 12353. TAILEVU: Nalovo, DA 821; Naingani Island, DA 3316. REWA: Suva, DA 1060. KANDAVU: Without further locality, DA 11939 (DF 19, Watkins 688). FIJI without further locality, M. Scott, DA 13270 (DF L.9546).

7. *Syzygium corynocarpum* (A. Gray) C. Muell. in Walp. Ann. Bot. Syst. 4: 839, as *S. corynocarpa*. 1858; Christophersen in Bishop Mus. Bull. 154: 23. 1938; Perry in J. Arnold Arb. 31: 355. 1950; Yuncker in Bishop Mus. Bull. 220: 202. 1959; J. W. Parham, Pl. Fiji Isl. 138. 1964, ed. 2. 199. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 132. 1970; St. John & A. C. Sm. in Pacific Sci. 25: 334. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 109. 1972. FIGURES 55A-C, 57C.

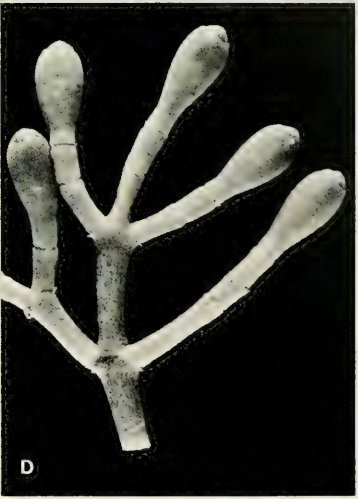
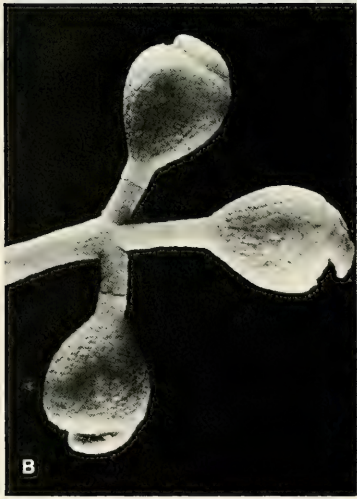
Eugenia paniculata Forst. f. Fl. Ins. Austr. Prodr. 90, nom. nud. 1786; non *Syzygium paniculatum* Gaertn.

Eugenia corynocarpa A. Gray, Bot. U. S. Expl. Exped. 1: 526. 1854, Atlas, pl. 64. 1856; Seem. in Bonplandia 9: 256. 1861, Viti, 436. 1862, Fl. Vit. 80. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 169. 1890. *Syzygium amicorum* sensu Yuncker in Bishop Mus. Bull. 220: 201. 1959; non C. Muell.

As noted in Fiji, *Syzygium corynocarpum* is an often spreading tree to 18 m. high, found at elevations from near sea level to about 900 m. in dense forest. The inflores-

FIGURE 55. A-C, *Syzygium corynocarpum*; A, triad of flowers just before anthesis, × 4; B, flower past anthesis, with sepals, most stamens, and style remaining, × 8; C, longitudinal section of flower just before anthesis, × 8. D, *Syzygium diffusum*; longitudinal section of flower just before anthesis, × 8. E, *Syzygium purpureum*; longitudinal section of flower bud, × 8. A from Yen 435 (Futuna, Horne Islands), B & C from Gillespie 2239, D from Smith 994, E from Smith 6681.





cence branches, hypanthium, and petals are usually noted as pink; the filaments and style are greenish yellow; and the fruits become dark red or purplish at maturity. Flowers have been obtained between July and January, fruits between November and July.

TIPIFICATION AND NOMENCLATURE: The type is *U. S. Expl. Exped.* (US 62251 HOLOTYPE; ISOTYPES at GH, K), collected either in Samoa or Fiji, in 1839 or 1840. Some of the type material is indicated as from Tahiti, but Gray noted the error in labelling. It may not be possible to ascertain whether the specimens are actually from Samoa or from Fiji (or whether more than one gathering is involved). The name *Eugenia paniculata* Forst. f. was referred to *E. amicorum* by both Gray and Seemann, each of them having reached his conclusion from examination of specimens at BM available to Forster. However, they may have been influenced by the assumption that *E. amicorum* was indeed from Tongatapu, like *E. paniculata*. In fact, however, *Syzygium amicorum* (q. v.) does not appear to be known from Tonga (W. R. Sykes, in litt.); both Sykes and I have independently reached the conclusion that the type of *E. amicorum* is actually a mislabelled Fijian specimen. *Eugenia paniculata* appears to be referable to the widespread *S. corynocarpum*, as no doubt do the other specimens listed by Seemann (under *E. amicorum*) from Tonga and Uvea.

DISTRIBUTION: *Syzygium corynocarpum* is known from Fiji, Tonga, Niue, the Horne and Wallis Islands, and Samoa. In Fiji it is represented by about 40 collections from six islands, but it may be anticipated elsewhere.

LOCAL NAMES AND USE: In addition to *yasiyasi*, names recorded in Thakaundrove are *lemba ndrau lailai*, *misimisi*, and *ulala*. In the Yasawas St. John has recorded the name *ulalo*; there the fragrant fruits are used for necklaces.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Naruarua Gulch, west of Mbatinaremba, *St. John 18043*. VITI LEVU: MBA: Mt. Matomba, Nandala, south of Nandarivatu, *Degener 14453*. NANDRONGA & NAVOSA: Singatoka district, *Greenwood 649A*; near Tonuve, *H. B. R. Parham 141*. SERUA: Hills north of Ngaloa, in drainage of Wainingere Creek, *Smith 9417*. NAMOSI: Hills bordering Wainavindrau Creek, vicinity of Wainimakutu, *Smith 8614*; track to Mt. Vakarongasiu, *DA 16110*; Wairoro Creek, *DA 13755 (DF 194, Bola 56)*. NAITASIRE: Savura Creek, *DA 14514*. REWA: Mt. Korombamba, *Gillespie 2239, 2441*. YANUTHA: Korolevu, *DA 13728*. MOTURIKI: *Seemann 153*. KORO: *DA 1045*. VANUA LEVU: MBUA: Ndelaiuvutu, near Ndriti, Ndama River, *DA 14889*. MATHUATA: Mt. Ndelaikoro, *DA 12828*; vicinity of Lambasa, *Greenwood 649*. THAKAUNDOVE: Near Urata, on Savusavu Bay, *Degener & Ordenez 13927*.

Syzygium corynocarpum is a sharply marked species, often ramiflorous or cauliflorous like the next two species in this treatment, and further characterized by its long-stipitate hypanthium with a vertically extended ovuliferous cavity and by fusiform fruits of a type not otherwise known in the Fijian Region.

8. *Syzygium diffusum* (Turrill) Merr. & Perry in *Sargentia* 1: 76. 1942; Perry in *J. Arnold Arb.* 31: 356. 1950. FIGURES 55D, 56A & B, 57A & B.

Eugenia diffusa Turrill in *J. Linn. Soc. Bot.* 43: 20. 1915; A. C. Sm. in *Bishop Mus. Bull.* 141: 107. 1936. *Syzygium diffusum* var. *diffusum*; J. W. Parham, *Pl. Fiji Isl.* 139. 1964, ed. 2. 200. 1972.

Tree to 20 m. high, often indicated as slender or spreading, occurring in usually dense forest at elevations from near sea level to about 1,200 m. The hypanthium, at first dull or bright yellow, becomes rich pink at anthesis and at length deep purple; the

FIGURE 56. A & B, *Syzygium diffusum*; A, distal portion of branchlet, with foliage and a terminal inflorescence (left), and lateral inflorescence from branchlet below leaves, with flower buds (right), $\times 1/4$; B, triad of flowers just before anthesis, $\times 4$. C & D, *Syzygium purpureum*; C, distal portion of branchlet, with foliage and inflorescences bearing young flowers, $\times 1/4$; D, terminal portion of an inflorescence, with young flowers, $\times 4$. A from *Smith 994* (leafless branchlet from *Smith 797*), B from *Smith 994*, C & D from *Smith 6681*.

petals are pink; and the filaments and style are pale yellow or cream-colored. Flowers have been obtained between May and February (i. e. in most months), fruits between August and December.

TYPIFICATION: The type is *im Thurn F.9* (K HOLOTYPE of two sheets), collected April 4, 1905, on Mt. Mbuke Levu (slightly below summit), Kandavu. It is necessary to retain the "F" in some of im Thurn's numbers, which may be repeated without the "F" for different collections.

DISTRIBUTION: Endemic to Fiji and thus far known from seven of the high islands. Approximately 25 collections are at hand.

LOCAL NAMES AND USE: *Yasiyasi*, *kavika* (both more or less generic); on Koro I was told that the timber is locally valued for underwater purposes.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Near summit of Mt. Evans Range, *Greenwood 948*; vicinity of Nandarivatu, *DA 2383*. NANDRONGA & NAVOSA: Southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, *Smith 4714*; northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, *Smith 5612*. NAMOSI: Vicinity of Namosi, *Gillespie 2689*. NAITASIRI: Nggoronggorotambuatini, Nasonggo region, *DA 15331*; vicinity of Viria, *Parks 20434*. REWA: Vicinity of Suva, *Yeoward 95*. KANDAVU: Mt. Mbuke Levu, *Smith 224*. OVALAU: Mt. Tana Lailai, *Graeffe s. n.*; vicinity of Levuka, *Milne 258*, p. p. KORO: Eastern slope of main ridge, *Smith 994*. VANUA LEVU: THAKAUNDROVE: Navonu Creek, Natewa Peninsula, *Howard 103*. RAMBI: *Horne 443*. TAVEUNI: Western slope between Somosomo and Wairiki, *Smith 797*; valley between Mt. Manuka and main ridge of island, *Smith 8290*.

Merrill and Perry in 1942 reduced *Syzygium aneityense* to the synonymy of *S. diffusum*. This disposition is certainly incorrect, *S. aneityense* having compact, terminal inflorescences and quite different foliage; I consider it closely related to *S. fijiense* and *S. phaeophyllum* (q. v.) and find no reason to extend the range of *S. diffusum* into the New Hebrides.

9. *Syzygium purpureum* (Perry) A. C. Sm., comb. et stat. nov.

FIGURES 55E, 56C & D, 57D & E.

Syzygium diffusum var. *purpureum* Perry in J. Arnold Arb. 31: 356. 1950; J. W. Parham, Pl. Fiji Isl. 139. 1964, ed. 2. 200. 1972.

Tree 2–25 m. high, found at elevations of 100–1,200 m. in dense forest or in forest patches in open country. The hypanthium is reddish in bud, turning black or purple in fruit, and the inflorescence branches have been noted as being rich purple or red. Flowers have been collected between October and April, fruits between January and August.

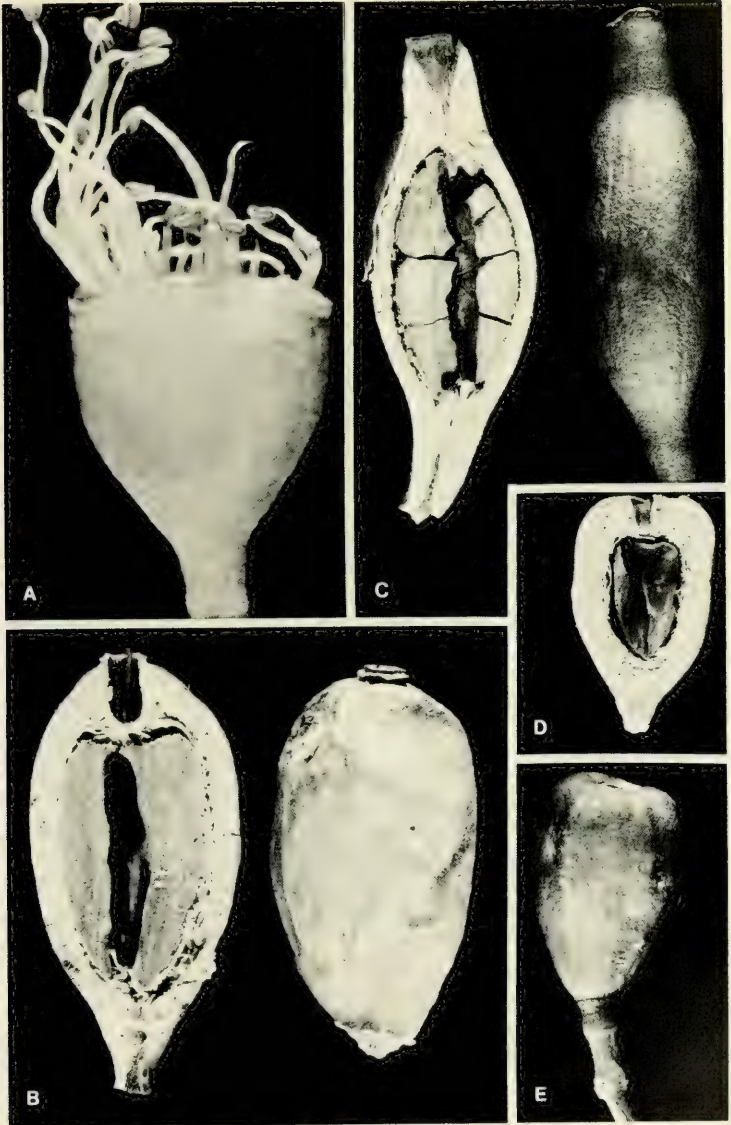
TYPIFICATION: The type is *Smith 6413* (A HOLOTYPE; many ISOTYPES), collected Oct. 29, 1947, on the summit ridge of Mt. Numbuiloa, east of Lambasa, Mathuata Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and known only from the two largest islands.

LOCAL NAME: *Yasiyasi*.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mt. Evans Range, *Greenwood 965*; northern portion of Mt. Evans Range, between Mt. Vatuyanitu and Mt. Natondra, *Smith 4351*; vicinity of Nandarivatu, *Parks 20778*, p. p., *DF 1094* (*Damanu 208*); near summit of Mt. Nanggaranambuluta, *Stauffer & Koroiveibau 5835*; slopes of Mt. Tomanivi, *DA 13054*. SERUA: Inland from Ngaloa, *Howard 215*. NAITASIRI: Waimbau Creek, Sawani-Serea road, *DA 11197*; Waimanu River region, southeast of Nasele, *DA 15429*; near Tholo-i-suva, *DA 10644*. NAITASIRI-REWA boundary: Mt. Kombalevu, *Parks 20318*. REWA: Mt. Koro-

FIGURE 57. A & B, *Syzygium diffusum*; A, flower past anthesis, the petals and many stamens fallen, × 8; B, mature fruit (right) and longitudinal section (left), showing cotyledons and persistent style, × 2. C, *Syzygium corynocarpum*; mature fruit (right) and longitudinal section (left), with (broken) cotyledons, × 2. D & E, *Syzygium purpureum*; D, longitudinal section of mature fruit, showing one cotyledon, × 2; E, mature fruit, × 2. A from *Smith 994*, B from *Smith 224*, C from *Gillespie 2441*, D & E from *DA 15429*.



mbamba, *Gillespie 2219, 2313, DA 3847*. VANUA LEVU: MATHUATA: Seangangga Plateau, in drainage of Korovuli River, vicinity of Natua, *Smith 6681*; Korovuli River region, *DA 12869*. THAKAUNDROVE: Nanggilokalou Creek (east of Mt. Ndikeva), *DA 16053*. FLJI without further locality, *DA 14158*.

Perry in 1950 separated this taxon from typical *Syzygium diffusum* solely on the basis of its smaller leaves, but more recently accumulated material suggests that it merits specific rank, although fully mature flowers are still not at hand. In addition to the smaller leaf blades, with closer principal secondary nerves (those connecting to loops in the intramarginal nerve, which is comparatively near the actual margin), flowers in advanced bud and fruits show differences. The hypanthium in general shape is somewhat intermediate between that of *S. diffusum* and *S. corynocarpum* (from which it is at once distinguished even in young bud by its solitary ultimate flowers each terminating an anthopodium). The apparently mature fruits of *S. purpureum* differ from those of *S. diffusum* in being smaller, somewhat more blunt at base, and slightly more truncate at apex.

10. *Syzygium effusum* (A. Gray) C. Muell. in Walp. Ann. Bot. Syst. 4: 838, as *S. effusa*. 1858; Perry in J. Arnold Arb. 31: 360. 1950; J. W. Parham, Pl. Fiji Isl. 140. 1964, ed. 2. 200. 1972; Hartley & Perry in J. Arnold Arb. 54: 216. 1973.

FIGURES 58A & B, 59A.

Eugenia effusa A. Gray, Bot. U. S. Expl. Exped. 1: 524. 1854; Seem. in Bonplandia 9: 255. 1861, Viti, 436. 1862, Fl. Vit. 79. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 169. 1890; Gibbs in J. Linn. Soc. Bot. 39: 146. 1909.

Tree 2–21 m. high, often locally abundant at elevations of 100–1,323 m. in dense or open forest and in the forest of crests and ridges. The hypanthium at anthesis is pink-tinged or reddish and apparently becomes white in fruit; the petals are cream-colored or pink without and white within; and the filaments are white, the anthers yellowish. Flowers and fruits may be expected throughout the year.

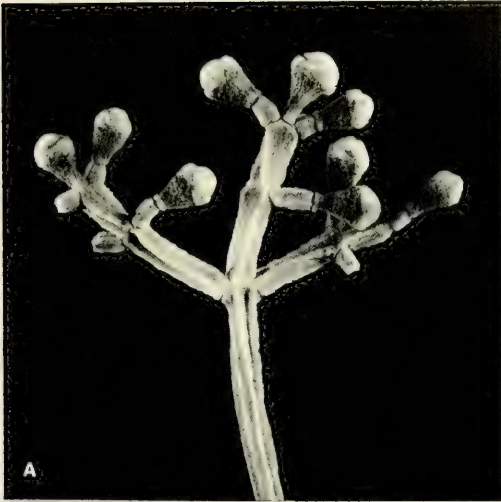
TYPIFICATION: The type is *U. S. Expl. Exped.* (US 47775 HOLOTYPE; ISOTYPES at GH, K), collected in 1840 in the vicinity of Mbua (Sandalwood) Bay, Mbua Province, Vanua Levu.

DISTRIBUTION: New Guinea to Fiji. Hartley & Perry (1973, cited above) have given this distribution, and probably correctly. Specimens from the Solomon Islands seem definitely to belong here, and New Guinean specimens are only slightly more variable, some of them having atypical terete inflorescence branches. Samoan specimens here questionably referred (Rechinger in Denkschr. Akad. Wiss. Wein 85: 318. 1910; Christophersen in Bishop Mus. Bull. 154: 23. 1938) are not even closely related to *S. effusum*. They have bracteate inflorescences and stamens in phalanges and are related to *S. confertiflorum*, although obviously not representing that species. About 60 Fijian collections of *S. effusum* from four high islands have been examined, but it doubtless occurs on many other islands.

LOCAL NAMES AND USE: *Syzygium effusum* is locally considered an important timber tree and is cut on a commercial scale; it is variously called *yasiyasi*, *yasivula*, *yasindravu*, and *yasiloa*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, *Gibbs 662*; summit of Mt. Tomanivi, *DA 13078*. NANDRONGA & NAVOSA: Nausori Highlands, *DF 636 (S1406/9, Damana N.H.8)*; Yawe, vicinity of Mbelo, near Vatukarasa, *Degener 15271*. SERUA: Nathengathenga Creek, upper Navua

FIGURE 58. A & B, *Syzygium effusum*; A, portion of inflorescence, $\times 4$; B, longitudinal section of flower just before anthesis, $\times 20$. C & D, *Syzygium minus*; C, longitudinal section of flower just before anthesis, $\times 8$; D, distal portion of branchlet, with foliage and inflorescences, $\times 2$. A & B from *DA L.13290*, C & D from *DA 14051*.



River, *DF 1123*; inland from Navutulevu, *DF 635 (S1406/8, Damanu N.L.2)*; Mbuyombuyo, near Namboutini, *Tabualewa 15595*; inland from Korovisilou, *DA 13827 (DF 270)*; inland from Yarawa Bay, *DF 1047 (Damanu 182)*; inland from Ngaloa, *DF 902*. NAMOSI: Summit of Mt. Vakarongasiu, *Gillespie 3284*; Nambukavesi Creek, *DF 634 (S1406/7, Bola N.I.19)*. NAITASIRE: Waimanu River, *DA 15646*; Central Road, *Tohill 155*. TAILEVU: Namulomulo, *DF 1073 (Damanu 187)*; Wainivesi River, *DF 558*. OVALAU and VANUA LEVU (Port Kinnaird and Koroivono, Thakaundrove): *Seemann 151*. VANUA LEVU: M̄BA: West of Thongea, Wainuu River, *DA 15778*. MATHUATA: Nambunambuna catchment area, *Berry 20*. MATHUATA: Vicinity of Natua, Seanggangga Plateau, *DA 12848*. THAKAUNDROVE: Mt. Kasi, Yanawai River region, *Smith 1821*; Nakatei Creek, west of Nakoroutari, *DF 633 (S1406/6, Seru L.8)*. MOALA: *Bryan 308*; above Maloku, *Smith 1346*.

11. *Syzygium minus* A. C. Sm., sp. nov.¹ FIGURE 56C & D.

Small tree 1.8–2.5 m. high, infrequent in crest thickets at an elevation of 760–850 m.; the hypanthium is red-tinged, becoming red in fruit. Flowers and fruits were obtained only in November.

TYPIFICATION: The type is *DA 14051* (coll. *D. Koroiveibau*) (BISH HOLOTYPE; ISOTYPES at BISH, SUVA), collected Nov. 23, 1964, on Natua Levu, Mt. Evans Range, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and known only from the type locality and from two collections, the type in flower and the second, obtained on the same date, in fruit.

AVAILABLE COLLECTION: VITI LEVU: M̄BA: Natua Levu, Mt. Evans Range, *DA 14052* (coll. *D. Koroiveibau*).

Syzygium minus, related to *S. effusum*, differs from that widespread species in its smaller and proportionately narrower leaf blades, its small and comparatively few-flowered inflorescences, and in having most of its flowers borne on slender, longer anthodia.

12. *Syzygium seemannianum* Merr. & Perry in *Sargentia* 1: 76. 1942; Perry in *J. Arnold Arb.* 31: 361. 1950; *J. W. Parham, Pl. Fiji Isl.* 142. 1964, ed. 2. 204. 1972.

FIGURE 59B & C.

Eugenia rivularis Seem. in *Bonplandia* 9: 256, nom. nud. 1861; A. Gray in *Proc. Amer. Acad. Arts* 5: 317, nom. nud. 1862, in *Bonplandia* 10: 35, nom. nud. 1862; Seem. *Viti*, 436, nom. nud., *Fl. Vit.* 80. 1865; *Engl. in Bot. Jahrb.* 7: 467. 1886; Drake, *Ill. Fl. Ins. Mar. Pac.* 170. 1890; Gibbs in *J. Linn. Soc. Bot.* 39: 146. 1909; non *Eugenia rivularis* Cambess. in *St.-Hil.* (1832) nec *Syzygium rivulare* Vieill. ex Guilloumin (1939).

Shrub or tree 1–12 m. high, often locally abundant from near sea level to an elevation of 900 m. in forest and thickets along streams, with branches often drooping

¹*Syzygium minus* A. C. Sm., sp. nov.

Arbor parva 1.8–2.5 m. alta, ramulorum gracilium internodis 2–4 distalibus 0.7–2 mm. diametro acute quadrangularibus; foliorum oppositorum petiolis gracilibus haud 1 mm. diametro 3–5 mm. longis supra canaliculatis fere ad basim anguste alatis; foliorum laminis tenuiter coriaceis obscure immerso-glandulosis elliptico-lanceolatis, (1–) 2–4 cm. longis, (0.5–) 0.8–1.5 cm. latis, basi attenuatis et in petiolum longe decurrentibus, apice obtusis vel anguste rotundatis, margine anguste recurvatis, costa supra parum depressa subtus elevata, nervis secundariis principalibus utrinsecus 7–10 subpatulis inter se 2–5 mm. distantibus supra immersis vel subimpressis subtus inconspicue prominulis, nervo marginali 0.5–1.5 mm. intra marginem inconspicuo, nervo externo plerumque recondito, rete venularum laxe reticulato supra immerso vel subimpresso subtus subprominulo; inflorescentia terminali vel nodis distalibus 1 vel 2 axillari anguste paniculato-cymosa (1.5–) 2–5 cm. longa et lata, ramulis gracilibus quadrangularibus, bracteis bracteolisque caducis, floribus (5–) 8–15 interduo sine antherodis sed plerumque antheropodia graciles 5–10 mm. longa terminantibus; hypanthio turbinato sub anthesi (cum margine suberecto ad 1 mm. longo) 3–4 mm. longo et in diametro subapicali 2–2.5 mm., basi in stipitem gracilem 0.5–1 mm. longum attenuato, disco vadose cupuliformi; sepalis 4 ovato-deltoides 0.5–1 × 1–1.5 mm. apice obtusis; petalis 4 incurvatis imbricatis ovato-suborbicularibus ad 2 × 2 mm. in calyptrom caducam cohaerentibus; staminibus 30–50 marginis hypanthii apice gerentibus, filamentis gracilibus ante anthesin 1.5–2 mm. longis, antheris ad 0.5 mm. longis; stylo ad 2 mm. longo; fructibus subglobosis 4–5 mm. diametro, basi rotundatis vel abrupte breviter stipitatis, apice rotundato-truncatis, stylo caduco. HOLOTYPE: FIJI: VITI LEVU: M̄BA: *DA 14051* (BISH).

into water and submerged in floods. The hypanthium is purplish, becoming black in fruit; the petals are white and pink-tinged; and the filaments and style are white. Flowers and fruits do not appear seasonal.

LECTOTYPIFICATION: Although the name *Eugenia rivularis* appeared in the Fijian literature several times prior to 1865, Seemann then first described it and based it on four specimens, all available at K, as follows: (1) *Milne 233*, from Ngau; (2) *Milne 186*, Rewa River, Viti Levu; (3) *Milne s. n.*, Rewa River; and (4) *Seemann 162*. All these specimens are in good flower, but the last is the best. *Syzygium seemannianum* was proposed as a new name for the species; Merrill and Perry (1942) and Perry (1950) cited the Seemann number at GH as an isotype but did not justify their selection. An appropriate citation is: *Seemann 162* (K LECTOTYPE, ISOLECTOTYPES at BM, GH), collected in August or September, 1860, along the Navua River, Serua Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known from five of the high islands, with more than 50 available collections.

LOCAL NAMES: The affinity of this *yasiyasi* to water is indicated by its frequent names *yasiwai* and *yasi ni wai*; also reported are the names *yasi ndravu*, *olala*, and *ulala*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: Mba: Near waterfalls, Mt. Evans Range, *Greenwood 138*; vicinity of Nandarivatu, *Degener 14272a*; Nandala Creek, south of Nandarivatu, *Smith 6255*, Nandrau road, *Gibbs 748*. NANDRONGA & NAVOSA: Southeast of Korokula Village, *Webster & Hildreth 14397*; Nathotholevu, near Rasikulu, *H. B. R. Parham 179*. SERUA: Waionamoli Creek, near Nambukelevu, Navua River, *DA 14487*; Nathengathenga Creek, upper Navua River, *DF 1120 (Damanu 219)*. NAMOSI: Vicinity of Nanggarawai, Wainikoroiuva River, *Gillespie 3204*; vicinity of Namosi, *Gillespie 2936*. RA: Vicinity of Nasukamai, *Gillespie 4691.3*; vicinity of Rewasa, near Vaileka, *Degener 15466*. NAITASIRI: Waindina River basin, *MacDaniels 1032*; Waimanu River, *DA 15578*. TAILEVU: Near Korovou, *Valentine 3*. REWA: Veisari River, *Vaughan 3272*. KANDAVU: Namalata isthmus region, *Smith 28*. OVALAU: Wainisavulevu Creek, Lovoni Valley, *DA 14506*. VANUA LEVU: THAKAUNDROVE: Navakuru, Wairikinggisi River, *Gressitt 2481*. VANUA LEVU without further locality, *H. B. R. Parham 343*.

Syzygium seemannianum is one of the most distinct species of the genus in Fiji, with narrow, acuminate leaf blades, quadrangular inflorescence branches, obconical-clavate hypanthia conspicuously narrowed toward base, and long styles. It was listed (as *Eugenia rivularis*) by van Steenis (*Rheophytes of the World*, 321, 1981); in my observation it always occurs near streams and dips its branches into them during periods of high water.

13. *Syzygium curvistylum* (Gillespie) Merr. & Perry in *Sargentia* **1**: 75, quoad basionymum, excl. spec. 1942; Perry in *J. Arnold Arb.* **31**: 359. 1950.

Eugenia amicorum sensu Seem. in *Bonplandia* **9**: 256. 1861, Viti, 436. 1862; non A. Gray.

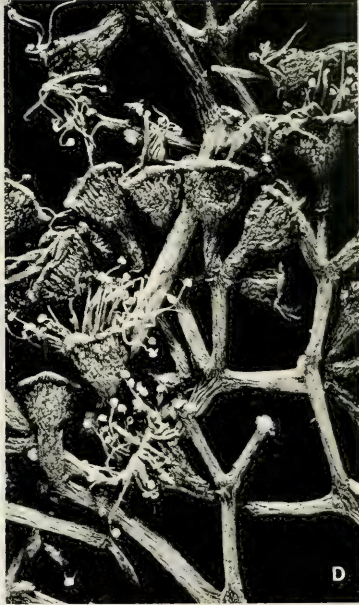
Eugenia curvistyla Gillespie in *Bishop Mus. Bull.* **83**: 21. fig. 26. 1931.

Syzygium curvistylum var. *parvifolium* Perry in *J. Arnold Arb.* **31**: 360. 1950; J. W. Parham, *Pl. Fiji Isl.* **138**. 1964, ed. 2. 200. 1972.

Syzygium curvistylum var. *curvistylum*; J. W. Parham, *Pl. Fiji Isl.* **138**. 1964, ed. 2. 100. 1972.

Tree 4–27 m. high, often slender or spreading, with a trunk to 60 cm. (or more?) in diameter, found from near sea level to an elevation of about 1,150 m. in dense or open forest or in forest patches in open country. The hypanthium is rich pink distally, becoming deep red to purple in fruit; and the petals and filaments are white to pale yellow. Flowers have been obtained between October and April, and fruits presumably a few months later.

TYPIIFICATION AND NOMENCLATURE: The type of *Eugenia curvistyla* is *Gillespie 4269* (BISH HOLOTYPE; ISOTYPES at BISH, US), collected Nov. 29, 1927, along trail near Vatuthere, vicinity of Nandarivatu, Mba Province, Viti Levu. Variety *parvifolium* is



based on *Smith 1556* (GH HOLOTYPE; many ISOTYPES), obtained April 20, 1934, in the southern portion of the Seatovo Range, Mbua Province, Vanua Levu. Perry was doubtful as to the status of the several collections she referred to *Syzygium curvistylum* var. *parvifolium* and could point to no differentiating characters except the smaller leaves. No geographic or altitudinal differences distinguish the two varieties of *S. curvistylum*, each occurring on both Viti Levu and Vanua Levu. With the accumulation of additional material, it is apparent that the foliage is only reasonably diverse and the difference in size inconsequential, not supported by other criteria. The species is a sharply marked one, in which I find no reasonable infraspecific taxa.

DISTRIBUTION: Fiji (where it is represented by about 25 collections from the two largest islands) and Samoa (where it seems infrequent on Savai'i and Upolu).

LOCAL NAMES AND USE: Reported names are *yasiyasi*, *yasiyula*, and *tavesau*; the tree is often used locally for houseposts and is occasionally cut commercially for timber, but apparently it is not one of the preferred species of *Syzygium*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mt. Koroyanitu, Mt. Evans Range, *DA 1414*; vicinity of Nandarivatu, *Gillespie 4266*; summit ridge of Mt. Nanggaranambuluta, east of Nandarivatu, *Gillespie 3875*; slope of Mt. Tomanivi toward Navai, *DA 14966*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 15622*. SERUA: Inland from Navutulevu, *DF 639 (S1406/13, Bola N. L. 5)*. NAMOSI: Nambukavesi Creek, *DF 638 (S1406/12)*. NAITASIRE: Waindrandra Creek, *DA 174*. TALEVU: Vicinity of Raralevu, *DA 2669*. VITI LEVU without further locality, *Seemann 152*. VANUA LEVU: MATHUATA: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, *Smith 6900*; southern slopes of Mt. Numbuloa, east of Lambasa, *Smith 6394*. THAKAUNDRIVE: Savuthuru Mt., near Valethi, Savusavu Bay region, *Degener & Ordonez 13843*; Naikawakawandamanu Creek, Navonu area, Natewa Peninsula, *Howard 201*.

From related species in Fiji (the subsequent two in this treatment) *Syzygium curvistylum* is readily distinguished by its comparatively large, persistent, basally imbricate sepals and its comparatively long filaments and style. It is also related to the New Hebridean *S. neepau* Guillaumin (in *J. Arnold Arb.* **12**: 257. 1931), which has broader and rounded (or retuse) leaf blades and flowers either without anthopodia or these very minute.

14. *Syzygium fijiense* Perry in *J. Arnold Arb.* **31**: 361. 1950; *J. W. Parham, Pl. Fiji Isl.* **140**. 1964, ed. 2. 200. 1972. FIGURES 59D, 60A.

Eugenia rubescens sensu Seem. in *Bonplandia* **9**: 256. 1861, Viti, 436. 1862, Fl. Vit. 80, p. p. 1865; non A. Gray.

Syzygium rubescens var. *koroense* Perry in *J. Arnold Arb.* **31**: 363. 1950; *J. W. Parham, Pl. Fiji Isl.* **142**. 1964, ed. 2. 203. 1972.

Tree 10–25 m. high, occurring from 50 to 750 m. in usually dense forest or in patches of forest in open country. The hypanthium is reddish-tinged, and the petals and filaments are white. Flowers have been collected between July and February, fruits between November and March.

TYPIIFICATION AND NOMENCLATURE: *Syzygium fijiense* is typified by *Smith 6722* (A HOLOTYPE; many ISOTYPES), collected Nov. 28, 1947, on the Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, Mathuata Province, Vanua Levu. The type of *S. rubescens* var. *koroense* is *Smith 1056* (GH HOLOTYPE; many ISOTYPES), obtained Feb. 2, 1934, on the main ridge of Koro. In proposing *S. rubescens* var. *koroense*, Perry indicated its difference from typical *S. rubescens* in the obvious

FIGURE 59. A, *Syzygium effusum*; mature fruit, showing persistent sepals, disk, and style, $\times 8$. B & C, *Syzygium seemannianum*; B, triad of flowers at anthesis, the central one still in bud and borne on anthopodium, $\times 4$; C, longitudinal section of flower at anthesis, the petals and some anthers fallen, $\times 8$. D, *Syzygium fijiense*; portion of inflorescence after anthesis, the petals and many stamens fallen, $\times 4$. A from *Smith 1821*, B from *DA 15578*, C from *DA 14487*, D from *Smith 6464*.

venation, the paler bark, the shorter inflorescences, and the slightly congested flowers with clavate hypanthia. Actually none of these characters seem dependable except the pronounced venation, but in fact the leaf proportions and texture are also quite different than those of *S. rubescens*. No consequential characters are discerned to separate *S. rubescens* var. *koroense* from *S. fijiense*, to which the variety seems safely reduced.

DISTRIBUTION: Endemic to Fiji and thus far collected on five of the high islands, about 20 collections having been so identified; some of these, however, have not been reexamined in connection with the present review and it seems probable that this species has been confused with *S. leucanthum*, although that species is very different in flowers, fruits, and minor foliage details.

LOCAL NAMES: *Yasiyasi*, *yasiyasi ndravu*, *yasindravu*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, *Gillespie 3853, 4043*. OVA-LAU: Mountains near Levuka, *Horne 383*; Port Kinnaird, *Seemann 154*. KORO: Main ridge, *Smith 1049*. VANUA LEVU: MATHUATA: Summit ridge of Mt. Numbuiloa, east of Lambasa, *Smith 6464*. TAVEUNI: Inland from Somosomo, *Gillespie 4813*.

15. *Syzygium phaeophyllum* Merr. & Perry in J. Arnold Arb. **26**: 103. 1945; Perry in op. cit. **31**: 359. 1950; J. W. Parham, Pl. Fiji Isl. **142**. 1964, ed. 2. 203. 1972.

FIGURE 60B.

Eugenia durifolia A. C. Sm. in Bishop Mus. Bull. **141**: 105. fig. 56. 1936.

Syzygium durifolium Merr. & Perry in Sargentia **1**: 76. 1942; non Merr. & Perry in Mem. Amer. Acad. Arts **18**: 176. 1939.

A tree about 6 m. high, found in dense forest at an elevation of 700-900 m.; apparently rare, only one collection being known.

TYPIFICATION: The type of *Eugenia durifolia*, for which *Syzygium phaeophyllum* is a new name, is *Smith 919* (BISH HOLOTYPE; many ISOTYPES), collected Jan. 8, 1934, on borders of the lake and swamp east of Somosomo, Taveuni.

DISTRIBUTION: Endemic to Fiji and known only from the type collection.

Syzygium fijiense and *S. phaeophyllum* are clearly close relatives, separable primarily by details of leaf venation which, upon analysis, reflect upon the origins of the marginal collecting nerves from subbasal secondaries. In *S. fijiense* these secondaries (FIGURE 60A) spread from the costa near its base and remain comparatively close to the margin. In *S. phaeophyllum* the secondaries that lead into the collecting nerves ascend from the lower part of the costa more sharply (FIGURE 60B) and are oriented well within the margin. Differences in the prominence and orientation of the veinlet reticulation are also apparent. However, the two taxa are closely related, both allied to the New Hebridean *S. aneityense* Guillaumin (in J. Arnold Arb. **12**: 256. 1931), which differs in having the flowers apparently always borne on long (3-5 mm.), slender anthopodia. In orientation of the collecting nerves, the leaf blades of *S. aneityense* resemble those of *S. fijiense*, in details of veinlet reticulation *S. phaeophyllum*.

16. *Syzygium rubescens* (A. Gray) C. Muell. in Walp. Ann. Bot. Syst. **4**: 839. 1858; Perry in J. Arnold Arb. **31**: 362. 1950.

Eugenia rubescens A. Gray, Bot. U. S. Expl. Exped. **1**: 525. 1854, Atlas, pl. 63. 1856; Seem. Fl. Vit. 80, p. p. 1865; Drake, Ill. Fl. Ins. Mar. Pac. **170**, p. p. 1890.

Syzygium rubescens var. *rubescens*; J. W. Parham, Pl. Fiji Isl. **142**. 1964, ed. 2. 203. 1972.

Tree 2-25 m. high, with a trunk up to 60 cm. (or more?) in diameter, occurring at elevations of 100-about 860 m. in dense or open forest or in forest on ridges. The

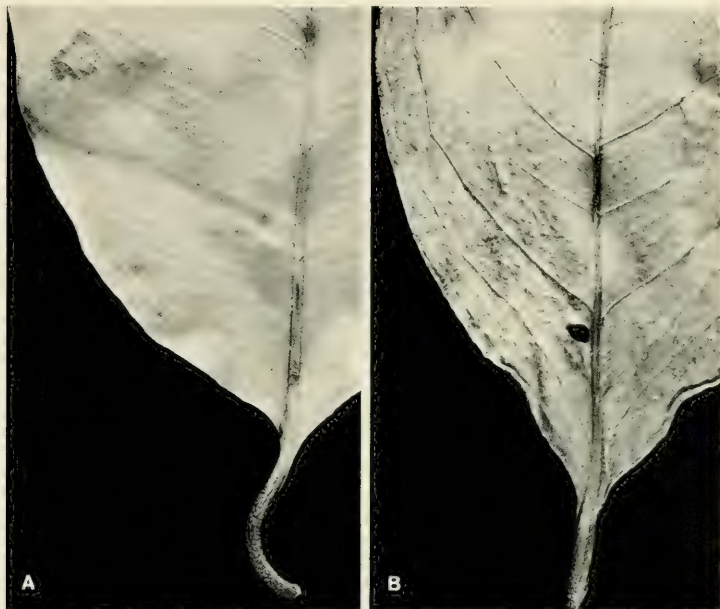


FIGURE 60. A, *Syzygium fijiense*: lower part of leaf blade, lower surface, to show pattern of marginal collecting nerves, $\times 2$. B, *Syzygium phaeophyllum*: lower part of leaf blade, lower surface, to show pattern of marginal collecting nerves, $\times 2$. A from Smith 6722, B from Smith 919.

hypanthium is green, becoming pink and then red to purple in fruit; the petals and filaments are white to pale pink; and the disk is said to be orange-pink. Flowers have been collected between May and January, fruits only in September and October.

TYPEFIICATION: The type is *U. S. Expl. Exped.* (US 47780 HOLOTYPE; ISOTYPE AT GH), obtained in 1840 on the island of Ovalau.

DISTRIBUTION: Endemic to Fiji and thus far represented by about 35 collections from the two largest islands and Ovalau.

LOCAL NAMES AND USE: As for many other Fijian *Syzygia*, recorded names are *yasiyasi*, *yasi*, *yasindamu*, and *yasindravu*; another name, *thome*, listed from Namosi Province, may be questioned. The species is occasionally used locally in house-building but is not utilized extensively as a commercial timber tree.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 934*; vicinity of Nandarivatu, *Greenwood 843*. NAMOSI: Hills bordering Wainavindrau Creek, vicinity of Wainimakutu, *Smith 8554*; Mt. Vakarongasiu, *Gillespie 3275*. NAITASIRI: Waimanu River, *DA L13291 (Berry 39)*; Tholo-i-suva, *DA 10253*; vicinity of Nasinu, *Gillespie 3481*. REWA: Mt. Korombamba, *Gillespie 2258*. OVALAU: Hills east of Lovoni Valley, *Smith 7314*; hills above Levuka, *Gillespie 4558*. VANUA LEVU: MBUA: Above Nandi Bay, *Milne 258*, p. p. MATHUATA: Vicinity of Mt. Ndelaikoro, *Howard 302*. THAKAUNDOVE: Above Nainggangi, Savusavu Bay region, *DA 15713*; Vaturova Tikina, *Howard 166*.

17. *Syzygium amicorum* (A. Gray) C. Muell. in Walp. Ann. Bot. Syst. 4: 839. 1858; Perry in J. Arnold Arb. 31: 363. 1950; J. W. Parham, Pl. Fiji Isl. 138. 1964, ed. 2. 199. 1972.

Eugenia amicorum A. Gray, Bot. U. S. Expl. Exped. 1: 524. 1854, Atlas, pl. 62. 1856; Seem. Fl. Vit. 79, quoad spec. vit. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 169, quoad spec. vit. 1890.

Shrub or slender tree 2–20 m. high, occurring from near sea level to an elevation of about 900 m. in dense or open forest. The flowers have a pale green or pink-tinged hypanthium that turns deep purple in fruit, white or pink-tinged petals, and white filaments. Flowers have been collected between October and June, fruits from November to January and also in May.

TIPIFICATION: In typifying *Eugenia amicorum*, Gray based his description on two collections, one said to be from Tonga (in flower) and the other from Fiji (in fruit). The flowering specimen, which served for the habit sketch of pl. 62 and fig. 1–3, should doubtless be considered the type: *U. S. Expl. Exped.* (US 47770 LECTOTYPE; fragmentary ISOLECTOTYPE at GH), said to have been obtained on Tongatapu, Tonga. The second collection (which bears an unpublished name of Gray) is in fruit: *U. S. Expl. Exped.* (US 73810; fragment at GH), illustrated in Gray's pl. 62, fig. 4–7 and said to have been collected in Fiji. The possibility that the lectotype is Fijian and not Tongan merits discussion. As mentioned above under *Syzygium corynocarpum*, both Gray and Seemann considered the name *Eugenia paniculata* Forst. f. (undescribed material from Tongatapu) to represent *E. amicorum*, but it has now been established that Forster's specimens actually represent *S. corynocarpum*. No Tongan material known to W. R. Sykes (in litt.) seems referable to *S. amicorum*, and this fact casts doubt on the stated locality of its lectotype collection. In fact, since various more recent Fijian collections seem well matched with Gray's description, illustration, and material of *E. amicorum*, it would seem a logical conclusion that his lectotype is another of the several mislabelled Exploring Expedition specimens and actually came from Fiji rather than Tonga. From material now available, one may conclude that *S. amicorum* is a Fijian endemic. Should this analysis prove correct, it is unfortunate that a species not known from the Friendly Islands (Tonga) should bear the epithet *amicorum*.

DISTRIBUTION: In view of the preceding discussion, I believe *Syzygium amicorum* to be endemic to Fiji, where it is represented on four of the high islands by about 30 collections.

LOCAL NAMES: *Yasiyasi*; in Mba Province the names *naivithi* and *kau sama* have been recorded.

REPRESENTATIVE COLLECTIONS: VITILEVU: MBA: Mountains near Lautoka, *Greenwood 906*; Mt. Evans Range, *Greenwood 1238*; southern slopes of Mt. Ndelainathovu, on escarpment west of Nandarivatu, *Smith 4938*. NADRONGA & NAVOSA: Southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, *Smith 4597*. NAITASIRE: Tholo-i-suva, *DF 530 (Watkins 792)*. OVALAU: Hills east of Lovoni Valley, *Smith 7263*. VANUA LEVU: MBUA: Upper Ndama River valley, *Smith 1598*; above Nandi Bay, *Milne s. n.* MATHUATA: Vicinity of Natua, Seangangga Plateau, *DA 12853*; southern slopes of Mt. Numbuloa, east of Lambasa, *Smith 6405*. MATHUATA-THAKAUNDRIVE boundary: Crest of Korotini Range, between Navitho Pass and Mt. Ndelaikoro, *Smith 535*. THAKAUNDRIVE: Mt. Kasi, Yanawai River region, *Smith 1803*; between Mbalanga and Valethi, Savusavu Bay region, *Degener & Ordonez 14039*; southwestern slope of Mt. Mbatini, *Smith 609*. TAVEUNI: Western slope between Somosomo and Wairiki, *Smith 839*.

Perry in 1950 accepted both *Syzygium rubescens* and *S. amicorum* as occurring in Fiji but admitted to difficulty in referring specimens to one or the other. The inflorescence characters utilized in her key do not seem reliable, and one is left with only the foliage distinctions described by Gray and shown in his plates. These distinctions are not entirely adequate, but in general they are usable. On the whole, the petioles of *S.*

rubescens are more slender and the leaf blades are thinner in texture and more obviously acuminate than those of *S. amicum*, which in various aspects of foliage presents a coarser impression. The separation is unsatisfactory, but one must be reluctant to combine concepts which, at their extremes, appear very different. At one extreme the "*S. rubescens* complex" (with the removal of *S. rubescens* var. *koroense*) is suggestive of *S. fijiense*, although the key characters utilized above would seem satisfactorily to separate them. At the other extreme a line between *S. amicum* and *S. grayi* is difficult to analyze, but to combine the typical specimens of these two would appear inexcusable. Collections that seem reasonably typical of *S. amicum* are *Smith 535, 4938, and DF 530*. Some collections cited by Perry (1950) as *S. grayi* are here removed to *S. amicum* (e. g. *Greenwood 906, Smith 1803, 4597*); I have placed such specimens in *S. amicum* because the leaf blades are definitely acute at base and decurrent on the petiole for approximately half its length, in spite of the very thick leaf texture and strong petioles suggestive of *S. grayi*. No very obvious floral characters are apparent that would distinguish from one another the individual taxa of *Syzygium* here numbered 14–19, but to recognize a single species for this alliance (however complexly it might be divided into infraspecific taxa) would appear to satirize past and future attempts to bring a degree of order to the intractable genus *Syzygium*.

18. *Syzygium grayi* (Seem.) Merr. & Perry in *Sargentia* 1: 76. 1942; Perry in *J. Arnold Arb.* 31: 358. 1950; *J. W. Parham, Pl. Fiji Isl.* 140. *fig. 54.* 1964, ed. 2. 200. *fig. 60.* 1972.

Eugenia sp. fl. *purpurascens*. Seem. in *Bonplandia* 9: 256. 1861.

Eugenia A. Gray in *Proc. Amer. Acad. Arts* 5: 317. 1862.

Eugenia grayi Seem. *Viti*, 436, nom. nud. 1862; A. Gray in *Bonplandia* 10: 35, nom. nud. 1862; Seem. *Fl. Vit.* 79. t. 16. 1865; Drake, *Ill. Fl. Ins. Mar. Pac.* 169. 1890.

Tree 3–15 (–24) m. high, often slender, with a trunk usually less than 50 cm. in diameter, found from near sea level to an elevation of about 1,100 m. in dense, open, or dry forest or sometimes in coastal thickets. The inflorescence is occasionally borne on stems and larger branches but usually is associated with the foliage; the hypanthium is green or yellowish and pink-tinged, becoming rich purple in fruit; the petals are white, sometimes pink-tinged; and the filaments and style are white or pale yellow. Flowers and fruits have been observed in practically all months.

TYPIFICATION: The only number originally cited was *Seemann 163*, but there are two sheets of this at K, labelled as from Kandavu and Ovalau respectively. *Seemann's t. 16* shows a flowering branchlet and floral dissections that doubtless came from the Kandavu specimen; the large background leaf and the young fruit (*fig. 4*) doubtless came from the Ovalau specimen. The Kandavu specimen seems to have served for most of the description and the critical part of the plate: *Seemann 163*, p. p. (K LECTOTYPE; ISOLECTOTYPES at BM, GH), collected in August or September, 1860, on the island of Kandavu. The other collection, a paratype, is *Seemann 163*, p. p. (BM, K), from Port Kinnaird, Ovalau; at BM both parts of *163* are mounted on a single sheet.

DISTRIBUTION: Endemic to Fiji and thus far known from five of the high islands, but common only on Viti Levu. About 60 collections have been examined.

LOCAL NAMES AND USE: Recorded names are *yasiyasi*, *yasivula*, *yasilemba*, *yasi-kavika*, and *ndrautangi*. Although the wood is occasionally used, the species is not sought as a commercial timber tree.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, *DA 14463*; Mt. Matomba, Nandala, south of Nandarivatu, *Degener 14455*; hills between Nggaliwana and Tumbendreketi Creeks, east of the sawmill at Navai, *Smith 5871*. NANDRONGA & NAVOSA: Nausori Highlands, *DF 449* (*Vetawa 25*);

northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, *Smith 5643*. SERUA: Hills between Navua River and Wainiyavu Creek, near Namuamua, *Smith 8969*; coastal hills in vicinity of Taunovo Creek, east of Wainiyambia, *Smith 9602*; Koromba Beach, Ndeumba, *DA 16017*. NAMOSI: Along Wainikoroiuva River between Nanggarawai and Namuamua, *Gillespie 3218*; slopes of Mt. Voma, *Gillespie 2516*; Nambukavesi Creek, *DF 333*; Wainandoi River, *DA 8345*. TAILEVU: Between Namata and Raralevu, *DA 2672*. NAITASIRI: Vicinity of Viria, *Meebold 16888*; Tholo-i-suva, *DA 13862 (DF 377, Damanu 64)*. REWA: Ngogya area, *Damanu 125*; near Suva, *MacDaniels 1010*. MBENGGGA: Raviravi, *DA 6048*. KANDAVU: Vicinity of Naikorokoro, *Damanu 50*. OVALAU: Lovoni Valley, *DA 17081*. VANUA LEVU: MBUA: Rukuruku Bay, *H. B. R. Parham 363*. MATHUATA: Vicinity of Natua, Seanggangga Plateau, *DA 15342*; southern slope of Mt. Numbuiloa, east of Lambasa, *Smith 6582*. THAKAUNDROVE: Maravu, near Salt Lake, *Degener & Ordenez 14161*.

19. *Syzygium simillimum* Merr. & Perry in *Sargentia* 1: 76. 1942; Perry in *J. Arnold Arb.* 31: 359. 1950; *J. W. Parham, Pl. Fiji Isl.* 142. 1964, ed. 2. 204. 1972.

An apparently rare, sparingly branched tree about 3 m. high, found in dense forest at elevations from about 20 to 400 m. The hypanthium is pinkish, turning dark red in fruit. Flowers were obtained in January and August, fruits only in January.

TYPIFICATION: The type is *Degener & Ordenez 14093* (A HOLOTYPE; ISOTYPES AT BISH, K, US), collected Jan. 12, 1941, in the eastern drainage of the Yanawai River, Thakaundrove Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and known from only two collections, one from each of the largest islands.

AVAILABLE COLLECTION: VITI LEVU: REWA: Near summit of Mt. Korombamba, *Gillespie 2349*.

The species would appear to be somewhat more than an extreme form of *Syzygium grayi*, differing markedly in its amplexicaul leaves and very compact inflorescences.

20. *Syzygium nidie* Guillaumin in *J. Arnold Arb.* 12: 257. 1931; Merr. & Perry in *Sargentia* 1: 77. 1942; Perry in *J. Arnold Arb.* 31: 357. 1950; *J. W. Parham, Pl. Fiji Isl.* 141. 1964, ed. 2. 203. 1972. FIGURE 61A & B.

Tree to 25 m. high and with a trunk to 120 cm. in diameter (usually not exceeding about 70 cm.), occurring in usually dense forest at elevations of about 50–850 m. The greenish hypanthium is pink or purple distally and becomes purple in fruit, and the petals, filaments, and style are white. Flowers have been noted between September and March, fruits between March and August.

TYPIFICATION: The type is *J. P. Wilson 984* (A HOLOTYPE; ISOTYPES AT BISH, K, P, US), collected in September, 1929, at Anelgauhat Bay, Aneityum, New Hebrides.

DISTRIBUTION: New Hebrides and Fiji; in the latter archipelago the species is known with certainty only from Viti Levu and Kandavu.

LOCAL NAMES AND USE: Recorded names are *yasiyasi*, *yasindamu*, and *yasiloa*; *ninga* was noted only for *Degener 14550*. The species is considered an important timber tree.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Nauwangga, south of Nandarivatu, *Degener 14550*; Sovutawambu, south of Nandarivatu, *Degener 14665*. SERUA: Nathengathenga Creek, upper Navua River, *DA 13769 (DF 461, Damanu 110), DF 827 (Damanu 167), 1205 (Damanu 228)*; inland from Korovisilou, *DF 559*; hills west of Waivunu Creek, between Ngaloa and Korovou, *Smith 9320*; inland from Ngaloa, *DF 588 or 812 (S1406/22, Kasiyap G-26), 866, 893*. NAMOSI: Nambukavesi Creek, *DF 555 (Vaisewa 25)*. NAITASIRI: Vunindawa path, *Vaughan 3427*. KANDAVU: Vicinity of Naikorokoro, *DA 12625, DF 628 (S1406/1, Damanu K. U.10)*; without further locality, *DA L.9580*.

FIGURE 61. A & B, *Syzygium nidie*; A, longitudinal section of flower just before anthesis, $\times 8$; B, mature fruit and longitudinal section, showing superposed cotyledons, $\times 2$. C & D, *Syzygium leucanthum*; C, longitudinal section of flower just before anthesis, $\times 8$; D, young fruit (left) and longitudinal section of mature fruit (right), $\times 2$. A from *Smith 9320*, B from *DF 555*, C from *Smith 6088*, D from *Smith 9252* (left) and *DF 645* (right).



Syzygium nidie and *S. leucanthum* form a discrete and well-marked species pair, as noted by Perry (1950), but the characters mentioned in her key are not dependable. The type specimen of *S. leucanthum* indeed has sharply quadrangular distal internodes of its branchlets, but other specimens that indubitably belong in the species have even the distal internode terete; this character fails in many species of *Syzygium*. Nevertheless, foliage characters (primarily referring to the base and apex of the blade and its decurrence on the petiole) seem dependable, as does fruit shape. Since both species are locally important timber trees and are often collected in sterile condition, a key adequately to separate them is necessarily prolix.

21. *Syzygium leucanthum* Perry in J. Arnold Arb. 31:357. 1950; J. W. Parham, Pl. Fiji Isl. 140. 1964, ed. 2. 201. 1972. FIGURES 61C & D, 62B.

Tree 10–30 m. high, with a trunk to 80 m. or more in diameter, occurring in dense forest at elevations of 50–970 m. The flowers have the hypanthium greenish and pink- or purple-tinged, the petals white and often pink-tinged, the filaments white, and the anthers pale yellow. Flowers have been obtained in months scattered throughout the year, fruits between November and March.

TYPEFICTION: The type is *Smith 6088* (A HOLOTYPE; many ISOTYPES), collected Sept. 18, 1947, on the northern portion of the Rairaimatuku Plateau, between Mt. Tomanivi and Nasonggo, Naitasiri Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and known from three of the high islands but commonly only on Viti Levu; 25 collections have been examined.

LOCAL NAMES AND USE: Recorded names are *yasiyasi*, *yasivula*, *yasindravu*, and *yasikavika*. Like the preceding it is commercially utilized as a timber tree.

REPRESENTATIVE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Nausori Highlands, *DA 15638*, *DF 644* (*SI406/18*). SERUA: Inland from Navutulevu, *DF*, Feb. 27, 1962 (*SI406/17*); inland from Namboutini, *DF 595* or *819* (*SI406/24*, *Damanu R.39*), 992 (*Damanu 178*); hills west of Waivunu Creek, between Ngaloa and Korovou, *Smith 9252*; inland from Ngaloa, *DF 591* or *815* (*SI406/20*, *Kasiyap G.18*), 892. NAMOSI: Mt. Nambui track, Korombasambasanga Range, *DA 14546*; Nambukavesi Creek, *DF 561* (*Vaisewa 27*), 642 (*SI406/16*). NAITASIRI: Waimanu River, *DA 15648*. KANDAVU: Vicinity of Naikorokoro, *DF 645* (*SI406/19*, *Bola K.U.13*). VANUA LEVU: MATHUATA: Ndongotuki Tikina, *Howard 163*.

Syzygium leucanthum is closely related to *S. inophylloides* (A. Gray) C. Muell., now known from Samoa, the Horne Islands, and Niue. The two species are very similar in foliage but differ in slight characters referring to petioles, flower size, and fruit that may be most concisely expressed in a key:

Petioles 5–18 mm. long, 1–2 mm. in diameter near base, conspicuously winged nearly to base or at least in distal half by the decurrent leaf blade base; hypanthium at anthesis or in advanced bud (including stipe) 5–9 mm. long and 4–7 mm. in subapical diameter, the sepals 1.3–2 × 3–5 mm., the petals 7–8 mm. in diameter, the filaments 8–18 mm. long, the style (6–) 10–12 mm. long; fruits pyriform, up to 26 × 16 mm., smooth, proximally abruptly tapering into a stout stipe. *S. leucanthum*
 Petioles (3–) 5–10 mm. long, 0.7–1.5 mm. in diameter near base, inconspicuously winged in the distal 1/3–1/2; hypanthium at anthesis or in advanced bud (including stipe) 5–7 mm. long and 4–5 mm. in subapical diameter, the sepals 0.5–1 × 2–3.5 mm., the petals 3–4 mm. in diameter, the filaments 6–10 mm. long, the style 3–4 mm. long; fruits ellipsoid or obovoid-ellipsoid, 22–38 × 17–30 mm., 14–16-costate or -grooved (costae becoming faint but still apparent at maturity), rounded at base or gradually tapering into a stout stipe. *S. inophylloides*

Another eastward extension of the *Syzygium nidie*-*S. leucanthum* group may be noted in *S. dealatum* (Burkill) A. C. Sm., now known to occur in Tonga, Niue, the Horne and Wallis Islands, and Samoa. *Syzygium dealatum* frequently has the quadrangular distal branchlet internodes characteristic of *S. leucanthum*, which it resembles in foliage but with leaf blades sometimes as large as 15 × 10 cm. In fruit shape it closely resembles *S. nidie*, but fruits have been noted as large as 27 × 25 mm., the pericarp seeming somewhat thinner than that of either ally. Its flowers are slightly

smaller than those of the two allied species in Fiji. The four species here discussed all have in common seeds with superposed cotyledons.

22. *Syzygium neurocalyx* (A. Gray) Christophersen in Bishop Mus. Bull. **154**: 27. 1938; Perry in J. Arnold Arb. **31**: 364. 1950; Yunccker in Bishop Mus. Bull. **220**: 204. 1959; J. W. Parham, Pl. Fiji Isl. 141. 1964, ed. 2. 203. 1972; St. John & A. C. Sm. in Pacific Sci. **25**: 335. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 32, 94. 1972. FIGURE 62A.

Eugenia neurocalyx A. Gray, Bot. U. S. Expl. Exped. **1**: 512. 1854, Atlas, pl. 59. 1856; Seem. in Bonplandia **9**: 256. 1861, Viti, 436. 1862, Fl. Vit. 78. 1865; Drake, Ill. Fl. Ins. Mar. Pac. **170**. 1890; Gibbs in J. Linn. Soc. Bot. **39**: 146. 1909; Yunccker in Bishop Mus. Bull. **184**: 54. 1945.

Jambosa neurocalyx C. Muell. in Walp. Ann. Bot. Syst. **4**: 849. 1858.

An often slender shrub or tree 3–9 m. high, occurring from near sea level to an elevation of about 900 m. in often dense forest, on ridges in thickets, and sometimes in beach thickets. The hypanthium is red-tinged and soon becomes dark red to deep purple; the petals and filaments are white; and the costate fruits attain a size of 7.5 × 6 cm. Flowers have been collected between January and August, fruits between May and December.

TYPIFICATION: The type is *U. S. Expl. Exped.* (US 47777 HOLOTYPE; ISOTYPE at GH), collected in 1840 either on Ovalau or in Mathuata Province, Vanua Levu. No locality is indicated on the specimens except Fiji, the islands being from Gray's notes, which also state: "planted near houses." The species is definitely indigenous, but the type material may have come from more than one collection.

DISTRIBUTION: Fiji, Tonga, the Horne Islands, and Samoa. In Fiji the species is known to occur on nine islands.

LOCAL NAMES AND USES: The name *lemba* seems firmly associated with *Syzygium neurocalyx*; other recorded names are *lembalemba* and *mamba*. The fruits are sometimes used in necklaces because of their fragrance, and the fruits are also said to yield a dye. Oil from the fruits is considered useful as a skin lotion, and the leaves and buds have been utilized as a medicine for lung ailments.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 291*; foot of Korolevu, north of Nandarivatu, *Gibbs 768*. SERUA: Flat coastal strip in vicinity of Ngaloa, *Smith 9332*. RA: Vicinity of Rewasa, near Vaileka, *Degener 15344, 15520*. REWA: Vicinity of Suva, *Tothill 146*. VITI LEVU without further locality, *Horne 1010*. VITI LEVU (Rewa and Namosi) and OVALAU (Port Kinnaird), *Seemann 159*. OVALAU: Hills southeast of valley of Mbureta River, *Smith 7396*. MOTURIKI: Nasesara, *DA 13719*. KORO: Eastern slope of main ridge, *Smith 1008*. NGAU: Hills east of Herald Bay, inland from Sawaieke, *Smith 7849*. VANUA LEVU: MBUA: Koromba Creek, *DA 15154*; southern portion of Seatovo Range, *Smith 1565*. MATHUATA: Nanduri, *Tothill 438*. THAKAUNDOVE: Mt. Mbatini, *Smith 659*. TAVEUNI: Nggeleni, *DA 14406*. MOALA: Near Naro, *Smith 1318*. MATUKU: *Milne 123*. FIJI without further locality, *Horne 287*.

Syzygium neurocalyx and *S. amplifolium* are a remarkably distinct pair of very robust species, with extremely large leaves with short, stout petioles, characterized by their large flowers with an extremely high number of stamens and by having their inflorescences essentially capitate, the component branches merged into an irregular glomerule. *Syzygium amplifolium* is not yet very well known; it seems to have a limited range in southern Viti Levu. *Syzygium neurocalyx* is more widespread (but not abundant) within Fiji and is, I believe, also indigenous in Tonga, the Horne Islands, and Samoa. Christophersen (1938, cited above) and Sykes (in litt.) cast some doubt on its indigenity in Samoa and Tonga, but I believe that it has merely been brought into villages from the wild as an ornamental or useful plant, this often being the case in Fiji.

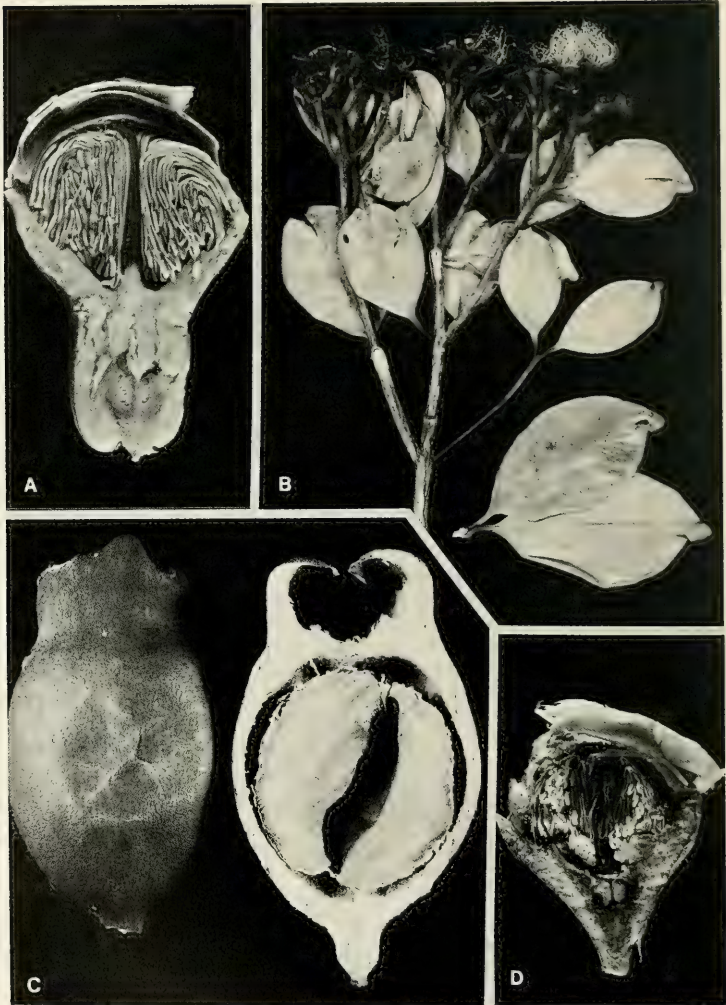


FIGURE 62. A, *Syzygium neurocalyx*; longitudinal section of flower just before anthesis, $\times 2$. B, *Syzygium leucanthum*; distal portion of branchlet, with foliage and inflorescences, and larger detached leaves from another plant, $\times 1/2$. C & D, *Syzygium gracilipes*; C, mature fruit and longitudinal section, showing collateral cotyledons, $\times 2$; D, longitudinal section of flower just before anthesis, $\times 2$. A from *Smith 1008*, B from *Howard 163* (detached leaves from *DF 645*), C from *Smith 8140*, D from *Smith 6057*.

23. *Syzygium amplifolium* Perry in J. Arnold Arb. 31: 365. 1950; J. W. Parham, Pl. Fiji Isl. 138. 1964, ed. 2. 199. 1972.

Shrub or slender tree 3–8 m. high, sometimes with spreading branches, growing in forested areas at elevations of 50–429 m. The hypanthium is purple-tinged, the filaments are yellow, and the large, smooth fruits have been recorded as green but probably become purple at maturity.

TYPIFICATION: The species is based on *Greenwood 981* (A HOLOTYPE; ISOTYPE at K), collected in May, 1943, in hills east of the Navua River, Namosi Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from southern Viti Levu.

LOCAL NAME: *Sea* has been recorded for *DA 1486*, but this Fijian name is well established for *Parinari laurinum* (Chrysobalanaceae). It is noteworthy, however, that Seemann was given the name *sea* for *Eugenia richii* or a plant that he suspected to be related, with "a fruit which is edible and has a very agreeable smell" (Fl. Vit. 78. 1865). Possibly *sea* refers in that case to *Syzygium neurocalyx*, which may be found in the same habitat as *S. richii*.

AVAILABLE COLLECTIONS: VITI LEVU: SERUA: Hills west of Waivunu Creek, between Ngaloa and Korovou, *Smith 9306*. NAMOSI: Hills north of Wainavindrau Creek, between Korombasambasanga Range and Mt. Naitarandamu, *Smith 8489*. NAITASIRE: Tholo-i-suva, *DA 501, 1486, 16189*; Prince's Road, mile 8 (near Tholo-i-suva), *Vaughan 3281*. REWA: Mt. Korombamba, *Gillespie 2316, Meebold 17067, DA 1160, 1161*; "summit Suva" (possibly Mt. Korombamba), *Tothill 148*.

24. *Syzygium gracilipes* (A. Gray) Merr. & Perry in Sargentia 1: 78. 1942; Perry in J. Arnold Arb. 31: 368. 1950; J. W. Parham, Pl. Fiji Isl. 140. *fig. 53*. 1964, ed. 2. 200. *fig. 59*. 1972. FIGURES 62C & D, 91.

Eugenia gracilipes A. Gray, Bot. U. S. Expl. Exped. 1: 513. 1854; Seem. in Bonplandia 9: 256. 1861, Viti, 436. 1862, Fl. Vit. 78. t. 15. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 169. 1890.

Jambosa gracilipes C. Muell. in Walp. Ann. Bot. Syst. 4: 849. 1858.

Eugenia vitiensis Turrill in J. Linn. Soc. Bot. 43: 21. 1915.

Syzygium vitiense Merr. & Perry in Sargentia 1: 78. 1942.

A usually slender shrub or tree (1–) 2–15 m. high, found in often dense forest from near sea level to an elevation of about 1,100 m. The hypanthium is yellowish and pink- or red-tinged but often with green sepals; the petals are white to yellowish and often pink-tinged; the stamens have white to rich yellow filaments and yellow anthers; and the style is greenish, turning red. The pendent infructescences bear fruits that are sometimes to 5 cm. in diameter and bright red to deep purple, with seeds (usually 1 but sometimes 3 or 4) about 15 mm. in diameter. Flowers and fruits are seen throughout the year.

TYPIFICATION AND NOMENCLATURE: *Eugenia gracilipes* is typified by *U. S. Expl. Exped.* (US 65273 HOLOTYPE), without locality other than Fiji but said by Gray to be from Vanua Levu (Sandalwood (Mbua) Bay in Mbua Province) and Ovalau. The type of *Eugenia vitiensis* is *im Thurn 9* (K HOLOTYPE), collected March 4, 1905, on the slopes of Mt. Mbuke Levu, Kandavu. (It may be noted that *im Thurn's 9* differs from his *F. 9*, which is the type of his *Eugenia diffusa*, also collected on Mt. Mbuke Levu but a month later than the present species.) Perry (1950) first combined the concepts of *Syzygium vitiense* and *S. gracilipes*.

DISTRIBUTION: Endemic to Fiji and reasonably abundant, now known from seven islands and more than 70 collections.

LOCAL NAMES AND USE: *Lululutu*, *mbongimbalawa*, and *siliwai* have been recorded, and more locally *naaalalo* (Wayu), *yasi kavika* (Mba), *lemba* (Nandronga & Navosa), *vutoro* (Namosi), *timbou* (Talevu), and *kau ni thivatu* (Ovalau). The flowers are sometimes used in necklaces.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Olo Creek, north of Yalombi, *St. John 18172*. VITI LEVU: MBA: North of Lomolomo, between Lautoka and Nandi, *Degener & Ordenez 13638*; Mt. Evans Range, *Greenwood 82A*: slopes of escarpment north of Nandarivatu, *Smith 6057*; Mt. Nanggaranambuluta, *Parks 20751*. SERUA: Upper Navua River, *DA 14881*; Mbuyombuyo, near Namboutini, *Tabualeva 15591*. NAMOSI: Northern base of Korombasambasanga Range, in drainage of Wainavindrau Creek, *Smith 8665*; Mt. Vakarongasiu, *Gillespie 3274*. NAITASIRI: Viria, *DA 496*; Waimanu River, *DA L.13286*; vicinity of Nasinu, *Gillespie 3476.5*. TAILEVU: Waimaro River, *DA 3031*; hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7108*. REWA: Mt. Korombamba, *Gillespie 2244*. VITI LEVU without further locality, *Seemann 158*. KANDAVU: Mt. Mbuke Levu, *DA 14939*. OVALAU: Slopes of Mt. Korotolutolu, west of Thawathi, *Smith 8002*; inland from Levuka, *Gillespie 4450*. VANUA LEVU: THAKAUNDRIVE: Nukulekaleka, *DA 13174*; west of Valethi, *Bierhorst F111*. TAVEUNI: Vicinity of Waiyevo, *Gillespie 4791*; slopes of Mt. Manuka, east of Wairiki, *Smith 8140*. YATHATA: Navakathuru, *DA 15558*.

Syzygium gracilipes must be considered one of the most striking plants of the Fijian understorey forest, especially in its typical and slender form (as illustrated in *Seemann's t. 15*), with graceful inflorescences dependent from the tips of drooping branches and bearing one or a few beautifully tinted flowers with their tufts of innumerable, spreading stamens.

25. *Syzygium richii* (A. Gray) Merr. & Perry in *Sargentia* 1: 77. 1942; Perry in *J. Arnold Arb.* 31: 366. 1950; Yuncker in *Bishop Mus. Bull.* 220: 204. 1959; J. W. Parham, *Pl. Fiji Isl.* 142. 1964, ed. 2. 203. 1972.

Eugenia richii A. Gray, *Bot. U. S. Expl. Exped.* 1: 510. 1854, *Atlas, pl. 58*. 1856; *Seem. Viti*, 436. 1862, *Fl. Vit.* 77. 1865; *Drake, Ill. Fl. Ins. Mar. Pac.* 170. 1890.

Jambosa richii C. Muell. in *Walp. Ann. Bot. Syst.* 4: 849. 1858.

Eugenia ritchei A. Gray ex *Seem.* in *Bonplandia* 9: 256. 1861.

Eugenia (ritchei) A. Gray var. (?) *Seem.* in *Bonplandia* 9: 256. 1861.

Eugenia sp. (an *richii* var.?) *Seem. Viti*, 436. 1862.

A spreading shrub or tree 3–10 m. high, with dense foliage, the trunk to 60 cm. in diameter, occurring only near sea level in beach or coastal thickets, or infrequently in forest very near the coast. The inflorescence forms a globular mass to 15 cm. in diameter; the hypanthium in flower is pale yellow, in fruit becoming white or red and sometimes 4-seeded; the petals are white to pale yellow and sometimes pink-tinged; and the filaments and style are greenish yellow to lemon-yellow. Flowers have been noted between May and December, fruits from October to March.

TYPIFICATION: The type is *U. S. Expl. Exped.* (US 47779 HOLOTYPE; putative ISOTYPE at GH), collected in Fiji in 1840. Gray's comment "at Ovolau, Rewa, Somusomu, Muthuata, &c" is not dependable; the holotype bears no detailed locality. Some of the putative isotypes in other herbaria may not represent the beach species shown by the holotype and Gray's illustration.

DISTRIBUTION: Fiji and Tonga; in Fiji the species has been collected on eight of the islands, but it is certainly to be expected on many others.

LOCAL NAMES: Recorded names are *mbokoi*, *onggori*, *kavika ni waitui*, and *nggori-goriwai*.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Thuvu, west of Singatoka, *Greenwood 785A*; on sandhills, Thuvu, *DA 16021*; Singatoka, *Greenwood 785*; Korotongo, *DA 12783*. SERUA: Navutulevu, *DF 1097*. REWA: Rewa River, *Seemann 165*; beach near Suva, *Yeoward 71*. MBENGGGA: Malambi, *Weiner 210*. KANDAVU: *Tothill 145*. OVALAU: Vicinity of Thawathi, *Smith 8099*. VANUA LEVU: MATHUATA: Mathuata Island, *Seemann 164*. THAKAUNDRIVE: Wailevu, on Savusavu Bay, *DA 14290*. TAVEUNI: Vicinity of Waiyevo, *Smith 8112*. MATUKU: *Tothill 145A*. VANUA MBALAVU: Near Sawana Village, *Garnock-Jones 1070*. FIJI without further locality, *Horne 1081*.

A definitive circumscription of *Syzygium richii* seems to have been elusive. The value of terete vs. quadrangular ultimate branchlet internodes is seen to be of no consequence; Gray's original plate shows both types on the same plant, a frequent

occurrence. Sometimes the angles are produced into coriaceous wings as much as 5 mm. broad. For diagnostic purposes the shape of branchlet internodes in the alliance of *S. richii*-*S. quadrangulatum* should be ignored. Perry (1950, cited above) listed many collections from the interiors of Fijian islands as possibly representing *S. richii*; in my opinion all but two of these represent *S. quadrangulatum*. Yuncker and Sykes have reported *S. richii* as occurring on Niue, but their concept is now recognized as *S. samarangense* (q. v., and Sykes in litt.). In fact, *S. richii* is a sharply demarcated species, restricted to coastal or near-coastal areas in Fiji and Tonga. Gray provided an excellent illustration of the species, which seems quite uniform and unmistakable.

26. *Syzygium samarangense* (Bl.) Merr. & Perry in J. Arnold Arb. **19**: 115, 216. 1938, in Mem. Amer. Acad. Arts **18**: 167. 1939; Hartley & Perry in J. Arnold Arb. **54**: 192. 1973; Whistler in Allertonia **2**: 122, 148. 1980; P. Ashton in Rev. Handb. Fl. Ceylon **2**: 425. 1981.

Eugenia javanica Lam. Encycl. Méth. Bot. **3**: 200. 1789; non *Syzygium javanicum* Miq. (1855).

Myrtus samarangensis Bl. Bijdr. Fl. Ned. Ind. 1084. 1826 or 1827.

Jambosa samarangensis DC. Prodr. **3**: 286. 1828.

Eugenia richii sensu Yuncker in Bishop Mus. Bull. **178**: 91. 1943, in op. cit. **184**: 54. 1945; non A. Gray.

Syzygium richii sensu Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 136, fig. 13. 1970; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 102. 1972; non Merr. & Perry.

Shrub or tree 1-15 m. high, in Fiji cultivated only near sea level. The petals and filaments are white; the fruits are borne on branches and when mature are red and as large as 15 × 8 cm. Flowers have been collected in May and July, fruits in March, July, and August.

TIPIFICATION AND NOMENCLATURE: *Eugenia javanica* is based on *Commerson* (P-LA HOLOTYPE); the epithet of this is not available in *Syzygium* because of *S. javanicum* Miq. Fl. Ned. Ind. **1** (1): 461. 1855, a new species from Java based on a Horsfield collection. Blume did not cite material of *Myrtus samarangensis* but the description was presumably based on a cultivated plant in his herbarium.

DISTRIBUTION: *Syzygium samarangense* is apparently indigenous in the Indo-Malesian area, but it has long been cultivated and naturalized, so that its precise nativity is not well established. Hartley and Perry (1973, cited above) imply that it is native from Burma through Indonesia (including the Philippines and New Guinea) to the Solomon Islands. The specimen from the New Hebrides listed by Guillaumin (in J. Arnold Arb. **12**: 255. 1931) as *Eugenia javanica* does not belong here, nor have I seen other collections of *S. samarangense* from the New Hebrides. In Fiji the species seems to have been introduced during the past half century and it is not known to be naturalized. In Samoa (Whistler, 1980) it is widely naturalized, and it occurs sparingly in Tonga and the Horne Islands. On Niue (Sykes, 1970, as *S. richii*) it is abundant in primary forest, where it is an important timber tree as tall as 30 m. Sykes (1970, and in litt.) believes it to be indigenous on Niue and in other parts of western Polynesia, but in those areas it seems to me more likely to have been an early (aboriginal?) introduction and a successful establishment.

LOCAL NAMES AND USES: *Kavika nganga*, *rose apple*, *Semarang rose apple*, *Java apple*. In Fiji the species is grown as an ornamental and also for its edible but insipid fruit.

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Lami, in private garden, DA 16788; Botanical Gardens, Suva, DA 5544, 9614, 9789, 12106. FIJI without further locality, DA 3405.

27. *Syzygium malaccense* (L.) Merr. & Perry in J. Arnold Arb. **19**: 215. 1938, in Mem. Amer. Acad. Arts **18**: 154. 1939, in Sargentia **1**: 78. 1942; Perry in J. Arnold Arb. **31**: 364. 1950; Yuncker in Bishop Mus. Bull. **220**: 203. 1959; J. W. Parham, Pl. Fiji Isl. **140**. 1964, ed. 2. 202. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 136. 1970; St. John & A. C. Sm. in Pacific Sci. **25**: 335. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 91. 1972; Schmid in Bot. Jahrb. **92**: 461. 1972; Hartley & Perry in J. Arnold Arb. **54**: 191. 1973; P. Ashton in Rev. Handb. Fl. Ceylon **2**: 428. 1981.

Eugenia malaccensis L. Sp. Pl. 470. 1753; A. Gray, Bot. U. S. Expl. Exped. **1**: 510. 1854; Seem. in Bonplandia **9**: 256. 1861; Engl. in Bot. Jahrb. **7**: 467. 1886; Drake, Ill. Fl. Ins. Mar. Pac. **169**. 1890; Merr. Interpret. Rumph. Herb. Amb. **398**. 1917; Christophersen in Bishop Mus. Bull. **154**: 19. 1938; B. E. V. Parham in Agr. J. Dept. Agr. Fiji **13**: 46. 1942; Yuncker in Bishop Mus. Bull. **178**: 91. 1943.

Jambosa malaccensis DC. Prodr. **3**: 286. 1828; Seem. Fl. Vit. **77**. 1865.

Eugenia malaccensis var. α Seem. Viti, 436. 1862.

Eugenia malaccensis var. β Seem. Viti, 436. 1862.

Jambosa malaccensis var. α Seem. Fl. Vit. **77**. 1865.

Jambosa malaccensis var. β Seem. Fl. Vit. **77**. 1865.

Eugenia richii sensu Guillaumin in J. Arnold Arb. **12**: 255. 1931; non A. Gray.

Tree 3–25 m. high, completely naturalized in thickets or dense or open forest from near sea level to an elevation of about 800 m. Usually the petals, filaments, and style are bright pink or even deep red, but a form with white petals is occasional (Seemann's var. α ; DA 15665). The fruit turns from cream-yellow to red at maturity, when it is fragrant and has a single seed embedded in white, juicy pulp. It does not appear seasonal in Fiji, flowers and fruits having been observed in most months between May and February.

TYPIFICATION: Four references were listed by Linnaeus, but I have not noted a lectotypification. The two color forms discussed by Seemann seem to occur through much of the cultivated range of the species.

DISTRIBUTION: The species has been so long cultivated that its place of origin is probably uncertain; various authors list southeastern Asia, western Malasia, etc. From the general Indo-Malesian area it has now become pantropical in cultivation, often seeming to be wild in the Solomons and New Hebrides. In Fiji, also, it sometimes occurs in dense and apparently not much disturbed forest, but it is certainly a thoroughly naturalized aboriginal introduction here and eastward in the Pacific. About 45 collections from ten islands have been examined from Fiji, but it may be anticipated on practically all inhabited islands.

LOCAL NAMES AND USES: The *Malay apple* or *rose apple* is commonly called *kavika* or *yasi kavika* in Fiji; the reddish-flowered form is *kavika ndamu* or *kavika ndamundamu*, the white-flowered form *kavika vulavula*. Other recorded names are questionable for this species: *lemba*, *mbokoi ni veikau*, *yasindravu*, *yasinggele*, and even *yasiyasi*. The fruit is edible raw and is also used for preserves, and the tree is ornamental. It has been recorded as used for timber, but this must be unusual.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Olo Creek, north of Yalombi, *St. John 18124*. VITI LEVU: MBA: Northern portion of Mt. Evans Range, between Mt. Vatuyanitu and Mt. Natondra, *Smith 4303*; Nandarivatu, *Gillespie 4252*. NANDRONGA & NAVOSA: Near Natuatuathoko, Singatoka River, *Horne 914*. SERUA: Nambuकेlevu, upper Navua River, *DA 15665*; inland from Korovisilou, *DF 499 (Damanu 138)*. NAMOSI: Vicinity of Namosi, *Gillespie 2527*; Lombau River or Nambukavesi Creek, *DF 556*. RA: Saulangitua, vicinity of Rewasa, near Vaileka, *Degener 15501*. NAITASIRI: Wainamo Creek, Wainimala River, *St. John 18206*; Waindina River basin, *MacDaniels 1056*. TAILEVU: Near Mburerua, *DA 15563*. REWA: Mt. Korombamba, *DA 3858*. VITI LEVU without further locality, *Seemann 161*. KANDAVU: Western end of island, near Cape Washington, *Smith 305*. OVALAU: Valley of Mbureta and Lovoni River, *Smith 7498*. NGAU: Hills east of Herald Bay, inland from Sawaieke, *Smith 7836*. VANUA LEVU: MBUA: Without further locality, *DA 15780*. MATHUATA: Mt. Uluimbau, south of Lambasa, *Smith 6597*. THAKAUNDROVE: Vatunivumonde Mt., Savusavu Bay region, *Degener & Ordenez 14030*. TAVEUNI: Vicinity of Waiyevo,

Gillespie 4646. VANUA MBALAVU: Lomaloma, *Garnock-Jones 1052*. TUVUTHA: On limestone slopes, *Bryan 543*. LAKEMBA: Between Yandrana and Vakano, *Garnock-Jones 948*. FIJI without further locality, *U. S. Expl. Exped.*

28. *Syzygium quadrangulatum* (A. Gray) Merr. & Perry in *Sargentia* 1: 77. 1942; Perry in *J. Arnold Arb.* 31: 365. 1950; J. W. Parham, *Pl. Fiji Isl.* 142. 1964, ed. 2. 203. 1972. FIGURE 63A.

Eugenia quadrangulata A. Gray, *Bot. U. S. Expl. Exped.* 1: 511. 1854; Seem. in *Bonplandia* 9: 256. 1861, *Viti*, 436. 1862, *Fl. Vit.* 78. 1865; Drake, *Ill. Fl. Ins. Mar. Pac.* 170. 1890.
Jambosa quadrangulata C. Muell. in *Walp. Ann. Bot. Syst.* 4: 849. 1858.

Tree 3–20 m. high, often slender or spreading, occurring between sea level and about 100 m. in dense or open forest or on its edges, sometimes on stream banks, and sometimes in fairly open country. The hypanthium is greenish white and sometimes pink-tinged, becoming red in fruit; the petals, filaments, and style are white to yellowish; and the anthers and disk are pale to dull yellow. Flowers and fruits are found throughout the year.

TYPE: The type is *U. S. Expl. Exped.* (US 47778 HOLOTYPE; ISOTYPE at GH), collected in 1840 on Ovalau.

DISTRIBUTION: Fiji and Tonga. From Fiji I have examined about 50 collections from ten islands, but the species is sometimes locally abundant and should be found on many other high and low islands. It has not previously been recorded as occurring in Tonga but is represented by *Parks 16211* ('Eua, said to be rare on plateau rocky ridges). The habitat difference between *Syzygium richii* and *S. quadrangulatum* thus seems the same in Tonga as in Fiji, the first species usually being associated with beach thickets and the second occurring inland (or at least not directly behind beaches).

LOCAL NAMES: *Syzygium quadrangulatum* is the species usually designated as *nggoringgoriwai*. Other recorded names, of questionable accuracy, are *ndaka*, *ndakanaka*, *vutoro*, *navutoro* (all Naitasiri), *vanggurunikawai* (Mathuata), and *mbokoi* (Thakaundrove).

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mt. Evans Range, *Greenwood 1158*; southern slopes of Ndelaianathovu, on escarpment west of Nandarivatvu, *Smith 4939*. NANDRONGA & NAVOSA: Korotongo, *DA 11978*; northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, *Smith 5619*. SERUA: Lomalangi road, *DF 1098*, p. p. NAMOSI: Hills bordering Wainavindrau Creek, vicinity of Wainimakutu, *Smith 8517*; Saliandrau, Wainikoroiuva River, *DA 14592*; Nambukavesi Creek, *DF 339* (*Vaisewa 11*). RA: Vatundamusewa, vicinity of Rewasa, near Vaileka, *Degener 15490*. NAITASIRI: Near Matawailevu, Wainimala River, *St. John 18234*; Sovi River, Waindina tributary, *DA 15045*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7191*. KANDAVU: Mt. Mbuke Levu, *Seemann 157*. OVALAU: Hills east of Lovoni Valley, *Smith 7308*. VANUA LEVU: MBUA: Upper Ndama River valley, *Smith 1693*. MATHUATA: Mountains along coast, *Greenwood 636*; southern slopes of Mt. Numbuloa, east of Lambasa, *Smith 6360*. THAKAUNDOVE: Savusavu Bay region, *Degener & Ordenez 13884*; Nandawa, Koroalau Creek, *DA 17174*. TAVEUNI: Slopes of Mt. Manuka, east of Wairiki, *Smith 8134*. MOALA: Near Maloku, *Smith 1380*. MATUKU: *Moseley*, July, 1874. VANUA MBALAVU: Nambavatu, *Tohill 158*. KAMBARA: On limestone formation, *Smith 1255*. FULANGA: On limestone formation, *Smith 1191*.

The four inland, indigenous species here numbered 28–31 have presented problems, although in general Perry's 1950 treatment of them seems reasonable. Characters of the leaf blade base and the petiole, difficult concisely to analyze, give them different aspects.

In general, *Syzygium quadrangulatum* and *S. nandarivatense* have leaves with short petioles and blades that are cordate to rounded at base, although the blades may occasionally tend to be subacute, but then they are only shortly decurrent on the petiole. The flowers of *S. quadrangulatum* are quite similar to those of *S. richii* in having a uniformly tapering, estipitate hypanthium that at full anthesis becomes

obtuse to rounded at base. This floral similarity has probably been responsible for the confusion in some herbarium identifications, although leaf proportions seem dependable. Although *S. quadrangulatum* may occur at low elevations, it never forms a part of the littoral vegetation as *S. richii* does. From both of these species *S. nandarivatense* is distinguished by having a proportionately slender hypanthium that remains tapering and stipitate even at full anthesis.

The two remaining species of the complex have appreciably longer petioles and leaf blades that narrow proximally and are distinctly decurrent on the petiole. *Syzygium gillespiei*, a lowland species, is considerably more robust than *S. tetrapleurum*, a montane species, but their fruits appear to me essentially similar and I question the fruit differences utilized by Perry (1950, p. 370). *Syzygium gillespiei* and *S. nandarivatense* appear to have flowers with the filaments at least weakly coherent into phalanges, but the value of this character even within a species may be questionable. In all members of this complex the distal branchlet internodes may vary from terete to sharply quadrangular; as discussed by Perry (1950, p. 370), such branchlet shape is not necessarily correlated with the age of the internode.

29. *Syzygium nandarivatense* (Gillespie) Perry in J. Arnold Arb. 31: 367. 1950; J. W. Parham, Pl. Fiji Isl. 140. 1964, ed. 2. 203. 1972. FIGURE 63B.

Eugenia nandarivatensis Gillespie in Bishp Mus. Bull. 83: 22. fig. 27. 1931.

Tree 4–18 m. high, occurring in dense forest or hillside thickets at elevations of about 30–1,100 m. The hypanthium is pinkish, maturing into a red fruit. Mature flowers have been obtained between September and December, mature fruits only in November.

TIPIFICATION: The type is *Gillespie 3972* (BISH HOLOTYPE and ISOTYPE), collected Nov. 22, 1927, in the vicinity of Nandarivatu, Mba Province, Viti Levu, presumably on the slopes of the escarpment.

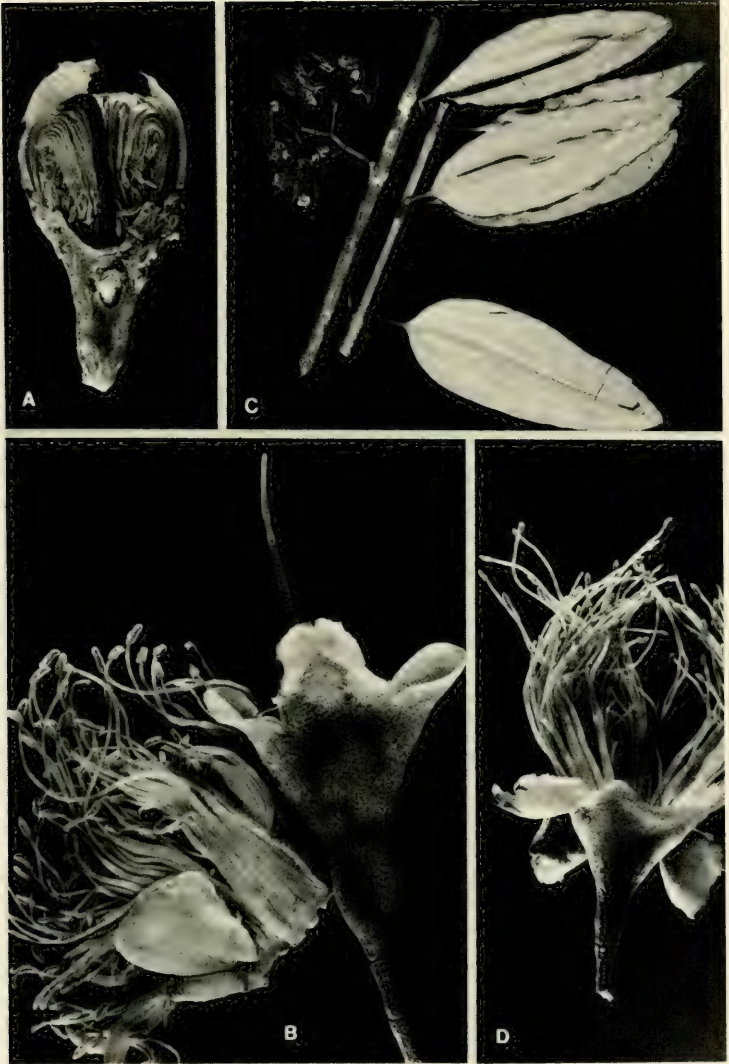
DISTRIBUTION: Endemic to Fiji and known only from Viti Levu.

LOCAL NAME: *Kau ni thivatu* (recorded for type collection only).

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 959*; western slopes of Mt. Nanggaranambuluta, east of Nandarivatu, *Smith 5738*; slopes of Mt. Tomanivi, *DA 13052*, *O. & I. Degener 32061*. NAMOSI: Valley of Wainambua Creek, south of Mt. Naitarandamu, *Smith 8782*; Nambukavesi Creek, *DF 541 (Vaiseva 6)*. NAITASIRE: Northern portion of Rairaimatuku Plateau, between Mt. Tomanivi and Nasonggo, *Smith 6126*. REWA: Nggoya area, *DA 17441*.

It may be noted that the stamens of *Syzygium nandarivatense* and *S. gillespiei* have filaments loosely coherent into phalanges (FIGURE 63B & D); this was not noted in the original descriptions but may be observed in the two type collections. The two species are also sometimes suggestively similar in general aspect, the key characters related to leaf base and petiole length not being absolute. Although *S. gillespiei*, a predominantly lowland species, is substantially the more robust in its foliage, *S. nandarivatense*, more frequent at higher elevations, has the larger flowers. Both species have similar tapering, infundibular hypanthia, providing the character that most readily distinguishes them from the more widespread *S. quadrangulatum*, to which *S. nandarivatense* is sometimes quite similar in foliage.

FIGURE 63. A, *Syzygium quadrangulatum*; longitudinal section of flower just before anthesis, $\times 2$. B, *Syzygium nandarivatense*; flower at anthesis, with androecium and a petal detached, $\times 2$. C & D, *Syzygium gillespiei*; C, foliage, and an inflorescence arising from branchlet below foliage, $\times 1/4$; D, flower at anthesis, $\times 2$. A from *Smith 1380*, B from *O. & I. Degener 32061*, C & D from *DA 16513*.



30. *Syzygium gillespiei* Merr. & Perry in *Sargentia* 1: 78. 1942; Perry in *J. Arnold Arb.* 31: 369. 1950; J. W. Parham, *Pl. Fiji Isl.* 140. 1964, ed. 2. 200. 1972.

FIGURE 63C & D.

Shrub or small tree 2–7 m. high, usually slender, occurring in forest at elevations of 150–900 m. Inflorescences are found on branches below the leaves as well as associated with them; the hypanthium, petals, and filaments are pale yellow, and the mature fruit is red.

TYPIFICATION: The type is *Gillespie 2269* (A HOLOTYPE; ISOTYPE at BISH), collected Aug. 15, 1927, in the vicinity of Tamavua, Naitasiri Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and known sparingly from the two largest islands. Most specimens cited are in bud, fully mature flowers having been obtained only in April and mature fruits only in August.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Tholo-i-suva, *DA 12213* (*DF 63, Watkins 731*); Central road, *Tothill 157*; Tamavua Ridge, mile 6 (on Prince's Road), *Vaughan 3180*; vicinity of Tamavua, *Gillespie 2463*. TAILEVU: King's Road, *DA 7208*. REWA: Track from Waimbue Creek to Waimanu River, *DA 15573*; Mt. Korombamba, *DA 1299, 16513*. VANUA LEVU: MATHUATA: Mt. Ndelaikoro, *DA 12797*. THAKAUNDROVE: Nggararavoravo, *DA 16059*.

31. *Syzygium tetrapleurum* Perry in *J. Arnold Arb.* 31: 369. 1950; J. W. Parham, *Pl. Fiji Isl.* 142. 1964, ed. 2. 204. 1972.

Shrub or slender tree 3–6 m. high, occurring in a limited area at elevations of 800–1,100 m. in dense forest or in forest on ridges. The hypanthium, petals, and filaments are white to pale yellow, and the fruit becomes red. Flowers have been seen only in July, fruits in August and September.

TYPIFICATION: The type is *Smith 5741* (A HOLOTYPE; many ISOTYPES), a fruiting collection obtained Aug. 20, 1947, in the vicinity of Nandarivatu, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Viti Levu and known with certainty from only a few collections made near the type locality.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, *Smith 5044*; Mt. Nanggaranambuluta, east of Nandarivatu, *DA 14449, 15254*.

32. *Syzygium jambos* (L.) Alston in *Trimen, Handb. Fl. Ceylon* 6: 115. 1931; Merr. & Perry in *J. Arnold Arb.* 19: 114, 217. 1938; Christophersen in *Bishop Mus. Bull.* 154: 27. 1938; Merr. & Perry in *Mem. Amer. Acad. Arts* 18: 169. 1939; Perry in *J. Arnold Arb.* 31: 369. 1950; Yuncker in *Bishop Mus. Bull.* 220: 203. 1959; J. W. Parham, *Pl. Fiji Isl.* 140. 1964, ed. 2. 200. 1972; Sykes in *New Zealand Dept. Sci. Indust. Res. Bull.* 200: 136. 1970; B. E. V. Parham in *New Zealand Dept. Sci. Indust. Res. Inform. Ser.* 85: 109. 1972; Schmid in *Bot. Jahrb.* 92: 459. *fig. 41–47*. 1972; P. Ashton in *Rev. Handb. Fl. Ceylon* 2: 427. 1981.

Eugenia jambos L. *Sp. Pl.* 470. 1753; B. E. V. Parham in *Agr. J. Dept. Agr. Fiji* 13: 46. 1942; J. W. Parham in *op. cit.* 29: 32. 1959.

Tree 6–12 m. high, cultivated and occasionally naturalized in thickets and waste places from near sea level to an elevation of about 850 m. The hypanthium is greenish white to reddish; the petals and filaments are white to pale yellow; and the mature fruits are white or yellowish, fragrant and somewhat rose-scented. Flowers have been noted in Fiji between July and December, fruits only in November and December.

TYPIFICATION: Four prior references were listed by Linnaeus, but I have not noted a

lectotypification.

DISTRIBUTION: The species is so widely cultivated and naturalized that its place of origin may be uncertain, although usually reported as western Malesia or southeastern Asia. Possibly it was first introduced into Fiji by J. B. Thurston, who listed it in his 1886 *Catalogue*. It is now naturalized in several Polynesian archipelagoes.

LOCAL NAMES AND USES: The *rose apple* is usually known to Fijians as *kavika ni vavalangi* or *kavika ni India*, sometimes merely as *kavika*. It is cultivated as an ornamental and for its fruit, which is edible raw but insipid and is more often used for jellies and confections.

AVAILABLE COLLECTIONS: VITI LEVU: Mba: In thickets on western and southern slopes of Mt. Tomani, *Smith 5141*. NAMOSI: Along Waindina River at Namosi, *Gillespie 2817*. RA: Near Nasukamai, *Gillespie 3394.4*. REWA: Suva Botanical Gardens, *DA 12101*; Government House grounds, Suva, *DA L.11440*. LAKEMBA: Tumbou Valley, *Garnock-Jones 917*.

33. *Syzygium aromaticum* (L.) Merr. & Perry in Mem. Amer. Acad. Arts **18**: 196. 1939;
B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 44. 1972;
P. Ashton in Rev. Handb. Fl. Ceylon **2**: 434. 1981.

Caryophyllus aromaticus L. Sp. Pl. 515. 1753.

Eugenia caryophyllata Thunb. Diss. Acad. Ups. 1, nom. illeg. 1788.

Myrtus caryophyllus Spreng. Syst. Veg. **2**: 485. 1825.

Eugenia caryophyllus Bullock & Harrison in Kew Bull. **13**: 52. 1958; Purseglove, Trop. Crops, Dicot. 401. fig. 64. 1968; J. W. Parham, Pl. Fiji Isl. ed. 2. 197. 1972.

Tree to about 15 m. high, infrequently cultivated near sea level. The flowers have yellowish green and red-tinged hypanthia and petals, white filaments, and pale yellow anthers; the mature fruit becomes dark red.

TYPIFICATION: Five prior references were given by Linnaeus; the three specific epithets listed above are all based on the same Linnaean concept.

DISTRIBUTION: Indigenous on some of the smaller islands of the Moluccas. Cloves were used as a spice by at least the fourth century and subsequently were widely used in trade and were eventually cultivated throughout the Moluccas, Indian Ocean islands, Malaya, the West Indies, etc. Most commercial cloves are now produced in Zanzibar and Madagascar. No Fijian herbarium vouchers are at hand, but trees occasionally persist. The plant was probably introduced by J. B. Thurston, who listed it in his 1886 *Catalogue*.

LOCAL NAME AND USES: *Clove tree*; the commercial cloves are the dried, unopened flower buds, widely used as a spice. Clove oil, produced by a distillation of buds, inflorescence branches, and leaves, is used in the manufacture of perfumes, soaps, and also medicinally. Interesting accounts of the uses and history of cloves are provided by Purseglove (1968, cited above) and Burkill (Dict. Econ. Prod. Malay Penins. ed. 2. 976-980. 1966).

Syzygium aromaticum is only distantly related to the other species in the present treatment. In its small flowers it would fall into my Group 2, but its hypanthium is comparatively elongate. As pointed out by Merrill and Perry (in Mem. Amer. Acad. Arts **18**: 135. 1939), the clove tree, the basis of the genus *Caryophyllus* L., in general aspect and in all characters except its free petals is more like *Syzygium* sensu str. than *Jambosa*.

11. **CLEISTOCALYX** Bl. Bot. Mus. Lugd.-Bat. 1: 84. 1849; Merr. & Perry in J. Arnold Arb. 18: 326. 1937; A. C. Sm. in op. cit. 36: 285. 1955, in Pacific Sci. 25: 494. 1971.

Acicalyptus A. Gray in Proc. Amer. Acad. Arts 3: 127. (May) 1854, Bot. U. S. Expl. Exped. 1: 551. (June) 1854, in Ann. Sci. Nat. IV. 4: 176. 1855.

Calyptranthes sensu Seem. Fl. Vit. 81. 1866; non Sw.

Cleistocalyx sect. *Acicalyptus* Merr. & Perry in J. Arnold Arb. 18: 325. 1937.

Cleistocalyx sect. *Eucleistocalyx* Merr. & Perry in J. Arnold Arb. 18: 325. 1937.

Eugenia sect. *Cleistocalyx* Henderson in Gard. Bull. Singapore 12: 11, 17, 264. 1949.

Trees or shrubs, glabrous throughout, the distal internodes of branchlets sometimes conspicuously or inconspicuously 4-angled, becoming terete; leaves opposite, petiolate or sessile, the blades coriaceous, pinnate-nerved, usually closely and obviously so, with an intramarginal collecting nerve sometimes paralleled by an outer nerve; inflorescences terminal or axillary, paniculate or metabotryoidal, often freely branched and many-flowered, the bracts small, deltoid, coriaceous, fugacious, the flowers in triads or sometimes solitary, sessile, borne on very short anthopodia or these lacking; flower buds just before rupturing at anthesis clavate or oblong-obovoid, the hypanthium obconical, smooth to sharply 4-angled, the calyx calyptrate, closed, rounded and umbonate to subulate-rostrate, strongly produced beyond summit of ovary, separating at summit of hypanthial rim by a circumscissile cleft, the sepals completely fused and indistinguishable; petals 4, small, white, inserted at hypanthial rim, broad-based, rounded, cucullate, strongly imbricate, coherent into a calyptra and falling with the calycine calyptra; stamens numerous, 2-seriate or more, inserted at hypanthial rim, strongly inflexed in bud, the filaments filiform, distinct, the anthers ellipsoid, medifixed, 2-locular, longitudinally dehiscent; ovary 2-locular, thick-walled, the dissepiment very thin, the ovules several—many per locule, slightly ascending from the axile placenta, the style subulate, the stigma small; fruits baccate, ellipsoid to subcylindric-oblong to subglobose, smooth to obviously 4-costate, the pericarp thick-carnose, the hypanthial rim (lacking the calyptra of fused sepals) persistent, erect, coriaceous, entire-margined; seed 1 (rarely 2?), the cotyledons large and hemispherical, the two opposing flat or concave faces separated or infrequently interlocking, attached to the minute hypocotyl and epicotyl.

LECTOTYPE SPECIES: *Cleistocalyx nitidus* Bl. (vide Merrill & Perry in J. Arnold Arb. 18: 333. 1937; Merrill in Philipp. J. Sci. 79: 364. 1950). *Acicalyptus* and its original species *A. myrtooides* A. Gray were first published simultaneously as a descriptio generico-specifica in May, 1854. Their publication in June, 1854, is usually listed (e. g. ING, 1979; for dates cf. Stafleu & Cowan, Tax. Lit. ed. 2. 1: 987, 991. 1976).

DISTRIBUTION: Southeastern Asia (from Burma and southern China) through Malasia to northern Australia and Lord Howe Island to New Caledonia and Fiji, with about 25 species. No report of the genus from the New Hebrides has been noted. Seven species are indigenous (and endemic) in Fiji.

USEFUL TREATMENT OF GENUS: MERRILL, E. D., & L. M. PERRY. Reinstatement and revision of *Cleistocalyx* Blume (including *Acicalyptus* A. Gray), a valid genus of the Myrtaceae. J. Arnold Arb. 18: 322-343. 1937.

In their 1937 treatment Merrill and Perry amply justify the separation of *Cleistocalyx* from *Syzygium*, maintaining Gray's genus *Acicalyptus* at the sectional level for five Fijian species. In reviewing the Malayan species of this alliance, Henderson (in Gard. Bull. Singapore 12: 1-293. 1949) maintained *Cleistocalyx* as a section of *Eugenia* (similarly treating *Syzygium* and *Acmena*), an overly conservative viewpoint following the several prior studies of Merrill and Perry. Other recent taxonomists (e. g. Backer &

Bakh. f. Fl. Java I: 333-351. 1963) have not questioned the generic status of *Cleistocalyx* any more than they have that of *Syzygium* and *Acmena*.

In his important studies of 1972 (listed under the family), emphasizing floral anatomy, Schmid indicates strong support for the separation of *Syzygium* and *Acmena* from *Eugenia*. He believes that *Cleistocalyx* and *Acicalyptus* are best retained as separate sections of *Syzygium* (or, if they are accepted at the generic level, that both genera must be retained). The two species of *Cleistocalyx* that Schmid studied in detail, *C. operculatus* (Roxb.) Merr. & Perry and *C. myrtoides* (A. Gray) Merr. & Perry (i. e. *Acicalyptus*), indicated to him significant differences (cf. Schmid in Bot. Jahrb. 92: 444-447 (t. 1 and 2), 452-454, 475-476, fig. 17-29. 1972), particularly in having the bundles of the floral tube monocyclic (*Cleistocalyx*) as opposed to zonocyclic (*Acicalyptus*). But in a very important addendum to the same paper (p. 478) Schmid, after examination of additional species of both *Cleistocalyx* and *Acicalyptus*, suggests that monocycly may merely reflect the very small flowers of *C. operculatus* and that conspicuous zonocycly characterizes other, larger-flowered species of *Cleistocalyx*. The value of floral anatomy in distinguishing between *Cleistocalyx* and *Acicalyptus* (whether genera or sections) seems diluted by Schmid's addendum.

The more obvious reproductive characters used by Merrill and Perry (1937, p. 325) to recognize two sections imply that the species of *Acicalyptus* have the hypanthium (calyx tube) 4-angled, the fruit also obscurely 4-angled, and the "calyx limb" in fruit narrow but usually deep. The remaining species of *Cleistocalyx* are said to have the hypanthium terete, the fruit not angled, and the "calyx limb" in fruit comparatively broad and shallow. A study of many more Fijian collections than were available to Merrill and Perry demonstrates that these characters are usable only at the specific level (and there not easily) and are without generic significance. The conclusions of Schmid as well as of Merrill and Perry depended heavily upon *Cleistocalyx myrtoides*, the most extreme Fijian species in respect to flower size, elongate calycine calyptra, and bud- and fruit-angularity. All other Fijian species (but flowers not known for *C. decussatus*) have the flower buds comparatively short, obscurely angled or quite smooth (terete), the calycine calyptra only 1-2 mm. long and merely umbonate (rather than subulate-rostrate), and the fruits either smooth (terete in cross section) from the start or 4- or 2-costate and becoming smooth. Few available fruits are fully mature, but it seems probable that the terete condition is usual at full maturity (cf. FIGURE 66B), at which time the "calyx limb" becomes "shallow" (as shown by Merrill and Perry, 1937, pl. 215, fig. 50).

Briggs and Johnson (1979, p. 224) retain both genera, stating: "Differences in leaf venation and in flowers give the two genera a different aspect, and there seems little practical difficulty in separating them." With the material at hand I am unable to support this statement. Such Fijian species as those numbered 5, 6, and 7 in the following key are so highly distinctive as to suggest separate Malesian ancestries rather than alliances within Fiji.

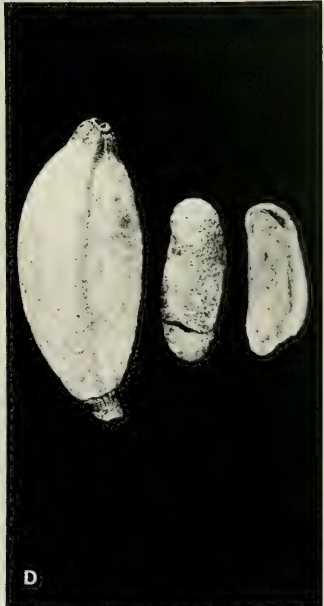
To summarize, *Cleistocalyx* is clearly separable from *Syzygium* by its highly distinctive flowers, but there seems no sound evidence for recognition of an endemic Fijian taxon *Acicalyptus* at any level.

KEY TO SPECIES

- Leaves obviously petiolate, the petioles rarely less than 4 mm. long, the blades acute to attenuate at base and obviously decurrent on petiole; hypanthial rim persistent on essentially mature fruits 1-4 mm. in diameter and 0.5-3 mm. long.
- Leaf blades elliptic to oblong or ovate (-lanceolate), distinctly tapering toward apex, the acumen usually obviously longer than broad.
- Flower buds just before rupturing 8-14 mm. long, sharply 4-angled, the calyptra subulate-rostrate, elongate, 4-6 mm. long above transverse separation; leaf blades comparatively small, 3-5 × 1-2.5 cm.; fruits (immature) ellipsoid-subcylindrical, up to 22 × 10 mm., sharply 4-angled, rounded to obtuse at base, contracted at apex. 1. *C. myrtooides*
- Flower buds just before rupturing 3-7 mm. long, obscurely 4-angled or smooth and without angles, the calyptra short- or rounded-conical, obtuse to umbonate or short-apiculate, 1-2 mm. long above transverse separation.
- Leaf blades ovate to ovate-lanceolate or lanceolate, (2.5-) 3.5-6 (-7) × 1.2-3 (-3.3) cm., obtusely to slenderly acuminate (acumen (2-) 5-15 mm. long from a base of 2-3 mm.), the collecting nerve 0.5-1.5 mm. within margin, an outer nerve if present comparatively obscure; ultimate branchlet internodes often conspicuously 4-angled; flower buds just before anthesis 4.5-6 mm. long, obscurely 4-angled or smooth; fruits ellipsoid to obovoid, smooth (not angled), up to 17 × 10 mm. (probably not fully mature), broadly obtuse at base and apex. 2. *C. seemannii*
- Leaf blades elliptic to oblong or elliptic-lanceolate, (5-) 7-12 × (2-) 3-5 cm., the acumen usually 5-15 mm. long from a base of 4-5 mm., the collecting nerve 1-3 mm. within margin, an outer nerve usually obvious; ultimate branchlet internodes terete or very obscurely angled.
- Ultimate flowers usually in triads, but sometimes solitary on minute ultimate inflorescence branches to 0.5 mm. long, the flower buds just before anthesis 3-4 mm. long, obscurely 4-angled or smooth; fruits elongate-ellipsoid, smooth (not angled or costate), up to 26 × 13 mm., obtuse at base and apex; leaf blades with the collecting nerve usually 1.5-3 mm. within margin. 3. *C. ellipticus*
- Ultimate flowers often solitary, borne on ultimate inflorescence branches 1-3 mm. long (but sometimes flowers in triads or seemingly in pairs), the flower buds just before anthesis 4-7 mm. long, obviously 4-angled; fruits ellipsoid to obovoid, 4-costate (but with 2 or all ribs or "angles" often obsolete), up to 25 × 15 mm., obtuse at base and apex; leaf blades with the collecting nerve usually 1-2.5 mm. within margin. 4. *C. longiflorus*
- Leaf blades obovate or elliptic-obovate, (2-) 3-9 × (1-) 1.5-4 cm., rounded or broadly obtuse or slightly emarginate at apex; ultimate flowers often solitary, borne on ultimate inflorescence branches 0.5-2 mm. long (but sometimes in triads or seemingly in pairs); flower buds just before anthesis 3-7 mm. long, obscurely 4-angled; fruits ellipsoid, smooth or very obscurely 4-costate, up to 30 × 20 mm., broadly obtuse at base, rounded at apex. 5. *C. eugenioides*
- Leaves sessile or subsessile, the petioles not more than 2 mm. long, the blades rounded or broadly obtuse or subcordate at base.
- Branchlets slender, 1-1.5 mm. in diameter distally, terete or slightly flattened, not angled; leaf blades elliptic, 5-7 × 2.5-4 cm., rounded to broadly obtuse at base, not amplexicaul, obtusely cuspidate at apex; flower buds just before anthesis clavate-obovate, 4-5 mm. long, the calyptra short- or rounded-conical, 1-1.5 mm. long above transverse separation. 6. *C. kasiensis*
- Branchlets stout, 3-10 mm. in diameter distally, conspicuously and decussately 2-angled or 2-winged in ultimate internodes, terete below; leaf blades obovate-oblong, 11-27 (-73) × 5-13 (-21) cm., narrowly cordate and subamplexicaul at base, rounded or emarginate at apex, the costa carinate beneath; fruits obovoid-ellipsoid, 2-costate, up to 20 × 8 mm. (not fully mature), obtuse at base, truncate-obtuse at apex, the persistent hypanthial rim 3-5 mm. in diameter and 1-2 mm. long. 7. *C. decussatus*
1. *Cleistocalyx myrtooides* (A. Gray) Merr. & Perry in J. Arnold Arb. 18: 329. pl. 215, fig. 6-8. 1937; J. W. Parham, Pl. Fiji Isl. 136. 1964, ed. 2. 196. 1972; Schmid in Bot. Jahrb. 92: 453. fig. 24-29. 1972. FIGURE 64A & B.

FIGURE 64. A & B, *Cleistocalyx myrtooides*; A, distal portion of branchlet, with foliage and inflorescences, × 1; B, essentially mature fruits, × 2. C & D, *Cleistocalyx seemannii* var. *seemannii*; C, distal portion of branchlet, with foliage and inflorescences, × 1; D, essentially mature fruit terminating in inflorescence, and foliage, × 2. A from Stauffer & Koroiveibau 5824, B from Gillespie 3971, C from Howard 180, D from DF 589.





Acalyptus myrtooides A. Gray in Proc. Amer. Acad. Arts 3: 127. (May) 1854, Bot. U. S. Expl. Exped. 1: 551. (June) 1854, Atlas, pl. 67. 1856, in Proc. Amer. Acad. Arts 5: 317. 1862, in Bonplandia 10: 35. 1862; Seem. Viti, 436. 1862; A. Gray in Ann. Sci. Nat. IV. 4: 176. 1855; Drake, Ill. Fl. Ins. Mar. Pac. 168. 1890; Gillespie in Bishop Mus. Bull. 83: 20. fig. 25. 1931.

Calyptanthus myrtooides Seem. Fl. Vit. 81. 1866.

Syzygium myrtooides Schmid in Bot. Jahrb. 92: 478. 1972.

A small tree, up to 5 m. high (as far as recorded), infrequent in forest at elevations of 600–1,100 m. As far as noted, flowers have been obtained in March (although those of the type material were collected between May and August) and fruits in November.

TYPEFICTION: The type is *U. S. Expl. Exped.* (US 47667 HOLOTYPE; ISOTYPES at GH, K), collected in 1840 in mountains of Mathuata Province, Vanua Levu, at an elevation of 2,000 feet. The only area in Mathuata of such an elevation visited by the Exploring Expedition must have been the Mathuata (Nawavi) Range on the north coast of Vanua Levu (cf. Vol. 1 of this *Flora*, fig. 6, 12).

DISTRIBUTION: Endemic to Fiji and thus far known only from the two largest islands, in which it seems local and infrequent.

LOCAL NAME: *Ndoinda* (Gillespie 3971).

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, Gillespie 3971; slopes of Mt. Nangaranambuluta, east of Nandarivatu, DA 13944, Stauffer & Koroiveibau 5824.

2. *Cleistocalyx seemannii* (A. Gray) Merr. & Perry in J. Arnold Arb. 18: 330, as *C. seemanni*. 1937.

KEY TO VARIETIES

Glands of leaf blade immersed, not obvious; hypanthium not apparently glandular. . 2a. var. *seemannii*
Glands of leaf blade copious and conspicuously pustulate beneath; hypanthium minutely glandular-pustulate. 2b. var. *punctatus*

2a. *Cleistocalyx seemannii* var. *seemannii*.

FIGURES 64C & D, 65A.

Acalyptus myrtooides sensu Seem. in Bonplandia 9: 256. 1861; non A. Gray.

Acicalyptus seemanni A. Gray in Proc. Amer. Acad. Arts 5: 317. (Jan.) 1862, in Bonplandia 10: 35. (Feb.) 1862; Seem. Viti, 436. 1862; Drake, Ill. Fl. Ins. Mar. Pac. 168. 1890; A. C. Sm. in Bishop Mus. Bull. 141: 107. fig. 57, b. 1936.

Calyptanthus seemanni Seem. Fl. Vit. 81. 1866.

Eugenia prora Burkill in Kew Bull. 1906: 4. 1906.

Cleistocalyx seemanni Merr. & Perry in J. Arnold Arb. 18: 330. pl. 215, fig. 3–5. 1937.

Cleistocalyx seemanni var. *seemannii*; J. W. Parham, Pl. Fiji Isl. 136. 1964, ed. 2. 196. 1972.

A shrub or tree, sometimes noted as spreading, 2–27 m. high, with a trunk to 60 cm. or doubtless more in diameter, found at elevations from about 60 to 1,220 m. The petals are white and the fruit, approaching maturity, is purple to black. Flowers and fruits have been obtained in scattered months between February and November.

TYPEFICTION AND NOMENCLATURE: The type is *Seemann 168* (GH HOLOTYPE; ISOTYPES at BM, K), collected in 1860 either on the Mathuata coast of Vanua Levu (Seemann, 1866, cited above) or at Port Kinnaird, Ovalau (in June, as per Seemann's field label on K sheet); the locality must remain doubtful. Gray's description was based on a specimen sent to him by Seemann and retained. In describing the essentially identical *Eugenia prora*, Burkill cited *Horne 774* and *874* (both in fruit) and *Yeoward 41* (in flower). In 1936 I indicated the Yeoward specimen as the type; while this was not a proper statement of lectotypification, the choice was the best, and I now indicate:

FIGURE 65. A, *Cleistocalyx seemannii* var. *seemannii*; detail of inflorescence, × 4. B, *Cleistocalyx ellipticus*; essentially mature fruit detached from part of infructescence, × 2. C & D, *Cleistocalyx longiflorus*; C, detail of inflorescence, × 4; D, essentially mature fruit and separated (dried) cotyledons (outer face left, inner face right), × 2. A from *Smith 241*, B from *Smith 8273*, C from *Smith 8054*, D from *Gillespie 3962*.

Yeoward 41 (K LECTOTYPE), collected in November, 1894, in Fiji without further locality.

DISTRIBUTION: Endemic to Fiji and thus far known from three or four of the high islands.

LOCAL NAME AND USE: *Yasiyasi*; a timber tree (at lower elevations).

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mt. Evans Range, summit of Mt. Koroyanitu, *Smith 4207*; summit and slopes of Mt. Nanggaranambuluta, east of Nandarivatu, *Gillespie 4345, Stauffer & Koroiveibau 5835*; upper slope of Mt. Tomanivi, *DA 7085*. SERUA: Inland from Namboutini, *DA*, Oct. 3, 1963 (*DF 826*); inland from Ngaloa, *DA*, March 26, 1963 (*DF 589* or *813, S1406/23*), *DF 590 (S1406/21)*. NAMOSI: "Koro Waiwai," *Horne 874*; summit of Mt. Vakarongasiu, *Gillespie 3283*; Nambukavesi Creek, *DA*, Aug. 2, 1961 (*DF 536*), *DA*, Feb. 15, 1962 (*DF 630* or *NI-14, S1406/3*). KANDAVU: Mt. Mbuke Levu, *Smith 241*. VANUA LEVU: MBUA: Above Nandi Bay, *Milne 219*. MATHUATA: Sasa Tikina, *Howard 180, 301*. THAKAUNDROVE: Eastern buttress of Mt. Ndikeva, *Smith 1876*.

Some plants from higher elevation (e. g. *DA 7085, Gillespie 3283*) tend to have thicker leaf blades that are smaller and without the long acumen that characterizes the leaves of low elevation plants; such plants if sterile are separable with difficulty from *C. myrtooides* but are strikingly different as to flowers and fruits. A nomenclatural separation within var. *seemannii* seems questionable but, without much conviction, I retain the variety with obvious, superficial glands proposed by Merrill and Perry as var. *punctatus*.

2b. *Cleistocalyx seemannii* var. *punctatus* Merr. & Perry in J. Arnold Arb. 18: 330, as *C. seemanni* var. *p.* 1937; J. W. Parham, Pl. Fiji Isl. 136. 1964, ed. 2. 196, both ref. as *C. seemanni* var. *p.* 1972.

Tree or shrub (?), infrequently found at elevations of 300–600 m. in forest or in ridge thickets.

TYPIFICATION: The type is *Graeffe* (GH HOLOTYPE; ISOTYPE at K), collected in flower in December, 1864, on Mt. Tana Lailai, Ovalau.

DISTRIBUTION: Endemic to Fiji and thus far known only from the type material and from the vicinity of Namosi, Viti Levu.

AVAILABLE COLLECTIONS: VITI LEVU: NAMOSI: Vicinity of Namosi, *Horne 774*; ridges southeast of Namosi Village, *Gillespie 2866*.

3. *Cleistocalyx ellipticus* (A. C. Sm.) Merr. & Perry in J. Arnold Arb. 18: 330. *pl. 215, fig. 9.* 1937; J. W. Parham, Pl. Fiji Isl. 136. 1964, ed. 2. 195. 1972.

FIGURE 65B.

Acicalyptus elliptica A. C. Sm. in Bishop Mus. Bull. 141: 107. *fig. 57, a, c.* 1936.

Tree 5–20 m. high, with a trunk to 50 cm. in diameter, found at elevations from near sea level to 900 m. in dense forest or in the thickets and forest of ridges and crests. The petals and filaments are white, and fruits have been noted as green turning to white and pink-tinged and at length deep pink. Essentially mature flowers have been obtained only in April (type collection), fruits between June and August.

TYPIFICATION: The type is *Smith 1567* (BISH HOLOTYPE; many ISOTYPES), collected April 20, 1934, in the southern portion of the Seatovo Range, Mbua Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and thus far known from three of the high islands.

LOCAL NAMES AND USE: *Yasiyasi, yasiloa*; a timber tree.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vicinity of Mbukuya, Mangondro Tikina, *DF 1269*; south of Mt. Tomanivi, *DA 14293*. NAITASIRI: Waimanu River, *DA L.13283*. VANUA LEVU: MBUA: Ridge above Thongea, Wainunu River, *DA 15796*. MATHUATA: Natindoyanga Creek, west of Lambasa, *DA 13462*; inland from Lambasa, *Howard 300*. THAKAUNDROVE: Natewa Peninsula, hills south of Natewa, *Smith 1969*. TAVEUNI: Valley between Mt. Manuka and main ridge of island, *Smith 8273, 8295*.

Cleistocalyx ellipticus and *C. longiflorus* are not readily distinguished by their foliage, but either flowers or fruits permit their reasonable separation. The flowers of *C. ellipticus* usually occur in sessile triads, the buds are comparatively short and only obscurely (if at all) angled, and even the young fruits are smooth (terete in cross section). *Cleistocalyx longiflorus* has usually solitary flowers (appearing pedicellate but actually sessile at the tips of ultimate inflorescence branch segments), the buds are longer and obviously angled, and the young fruits are 4-costate (but perhaps becoming smooth when fully mature).

4. ***Cleistocalyx longiflorus*** (A. C. Sm.) Merr. & Perry in J. Arnold Arb. **18**: 329. *pl.* 215, *fig.* 1, 2. 1937; J. W. Parham, Pl. Fiji Isl. 136. 1964, ed. 2. 196. 1972.

FIGURE 65C & D.

Acicalyptus longiflora A. C. Sm. in Bishop Mus. Bull. **141**: 109. *fig.* 57, *d.* 1936.

A sometimes slender tree 12–24 m. high, with the trunk to 30 cm. in diameter (but doubtless frequently larger), occurring from near sea level to about 900 m. in usually dense forest. The petals and filaments are white, the anthers pale yellow, and the fruit turning from green to pink and red. Flowers and fruits have been obtained in months scattered throughout the year.

TIPIFICATION: The type is *Storck XXV* or *XXVI* (K HOLOTYPE, with both numbers on sheet; ISOTYPE at GH), collected in flower in June, 1883, in Fiji without further locality.

DISTRIBUTION: Endemic to Fiji and thus far known from four of the high islands.

LOCAL NAME AND USE: *Yasiyasi*; a timber tree.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, *Gillespie 3190, 3962*. SERUA: Nathengathenga Creek, upper Navua River, *DF 1206 (Damanu 229)*; Nambukelevu, upper Navua River, *DA 15667*; inland from Namboutini, *DA, Dec. 13, 1962 (DF 504)*; inland from Namangumangua, *DF 1099*, p. p. (*Damanu 213*); inland from Ngaloa, *DA, Dec. 12, 1963 (DF 895)*, *DA, Dec. 17, 1963 (DF 865)*, *DA 14691, 15671*. NAMOSI: Nambukavesi Creek, *DA, Aug. 2, 1961 (DF 535)*. NATIASIRI: Korosuli, Wainimala River, *Horne 959*. TAILEVU: Without further locality, *Howard 317*. REWA: Slopes of Mt. Korombamba, *Gillespie 2277*. KANDAVU: Vicinity of Naikorokoro, *DA, Feb. 23, 1962 (DF 637, S1406/10)*. OVALAU: Hills west of Lovoni Valley, on ridge south of Mt. Korolevu, *Smith 7534*; summit and adjacent slopes of Mt. Korotolutolu, west of Thawathi, *Smith 8054*. MOALA: Near Maloku, *Smith 1343*.

5. ***Cleistocalyx eugenioides*** Merr. & Perry in J. Arnold Arb. **18**: 330. 1937; J. W. Parham, Pl. Fiji Isl. 136. 1964, ed. 2. 196. 1972. FIGURE 66A & B.

Eugenia confertiflora sensu Seem. in Bonplandia **9**: 256. 1861; A. Gray in Proc. Amer. Acad. Arts **5**: 317. 1862, in Bonplandia **10**: 35. 1862; non A. Gray (1854).

Eugenia sp. nov. *confertiflor. proxima* Seem. Viti, 436. 1862.

Calyptranthes eugenioides Seem. Fl. Vit. 81, nom. illeg. 1866; non Cambess. (1829).

Acicalyptus eugenioides Drake, Ill. Fl. Ins. Mar. Pac. 168, nom. illeg. 1890; Niedenzu in Engl. & Prantl, Nat. Pflanzenfam. III. 7: 86. 1893.

Tree 4–25 m. high, occurring in sometimes dense forest at elevations from near sea level to 1,127 m. The flower buds are greenish white and pink-tinged distally, the filaments are white, and the fruits are purple when essentially mature. Flowers have been observed between December and June, fruits in March and August.

TIPIFICATION: The type of *Calyptranthes eugenioides* Seem. is *Seemann 156*, collected in 1860 in Fiji without further locality. *Cleistocalyx eugenioides* is a new name based on that later homonym and for nomenclatural purposes dates from 1937 and is to be used without a parenthetical author.

DISTRIBUTION: Endemic to Fiji and thus far known from three of the high islands.

LOCAL NAME AND USE: *Yasiyasi*; a timber tree.



AVAILABLE COLLECTIONS: VITI LEVU: Mba: Koro-O, south ridge, vicinity of Nandarivatu, *Stauffer & Koroiveibau 5814*; summit of Mt. Nanggaranambuluta, east of Nandarivatu, *Gillespie 4335*. NAITASIRI: Waimanu River, *DA L.13288 (Berry 39A)*. NGAU: Slopes of Mt. Ndelaito, on northern spur toward Navukailangi, *Smith 7871*. VANUA LEVU: MATHUATA: Wainikoro River, *Greenwood 710*; Ndongotuki Tikina, *Howard 156*. THAKAUNDROVE: Nakatei Creek, west of Nakoroutari, *DF 641 (S1406/15)*; Navonu Creek, Natewa Peninsula, *Howard 213*.

Cleistocalyx eugenioides seems more closely allied to certain Malesian species, such as the Bornean *C. leptocladus* Merr. & Perry, than to its Fijian congeners, but no very close relationship is evident.

6. *Cleistocalyx kasiensis* A. C. Sm. in Pacific Sci. 25: 494. 1971. FIGURE 66C.

An apparently stunted small tree to 1.5 m. high, found in forest at an elevation of about 150 m. The flower buds and filaments are white.

TYPIFICATION: The type is *DA 15740* (BISH HOLOTYPE), collected by E. Damanu on June 7, 1968, in a young *yaka* (*Dacrydium nidulum* de Laubenfels) sample plot in the Mt. Kasi area, Thakaundrove Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and known only from the type collection.

LOCAL NAME: *Yasiyasi*.

Cleistocalyx kasiensis appears only remotely related to other known Fijian species, in foliage being more suggestive of *C. paradoxus* (Merr.) Merr. & Perry, of Borneo, or *C. brongniartii* Merr. & Perry, of New Caledonia, from both of which it differs in many details.

7. *Cleistocalyx decussatus* A. C. Sm. in Pacific Sci. 25: 495. 1971.

FIGURES 66D, 67.

Tree 4–12 m. high (probably becoming larger), known from dense forest at an elevation of about 150–180 m. The only known fertile collection is the type, in fruit.

TYPIFICATION: The type is *DF 310 (I. Bola 108)* (BISH HOLOTYPE; ISOTYPES at K, SUVA), collected Feb. 22, 1962, in the vicinity of Tholo-i-suva, Naitasiri Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and known sparingly from the two largest islands.

LOCAL NAMES: *Yasiyasi*; *yasimoli*.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Waindrandra Creek, lower Waindina River basin, *DA 647* (coll. *J. Samuda*); Savura Nature Reserve, near Tholo-i-suva, *Berry 257* (coll. *I. Macunagio*); vicinity of Tamavua, *Gillespie 2462* (juvenile). VANUA LEVU: THAKAUNDROVE: Navonu Creek, Natewa Peninsula, *Berry 199*.

It seems surprising that such a spectacularly distinct tree, occurring in quite accessible areas, has not been obtained in flower, the collections other than the type being sterile. The earliest collection is that of Gillespie (Aug. 27, 1927, BISH). Such sharply distinctive characters as the decussately 2-winged, robust distal internodes, the large, sessile, subamplexicaul leaf blades with the sharply carinate costa excurrent into the branchlet wing, and the sharply 2-winged inflorescence branches appear to be unique in the genus. The immature, 2-costate fruits are basically similar to those of some other Fijian species of the genus.

In its comparatively large, sessile leaf blades with costas sharply keeled on the lower surface, *Cleistocalyx decussatus* is suggestive of *Syzygium wolfii*. These two are the

FIGURE 66. A & B, *Cleistocalyx eugenioides*; A, detail of inflorescence, $\times 4$; B, mature fruits, $\times 2$. C, *Cleistocalyx kasiensis*; distal portion of branchlet, with foliage and an inflorescence, $\times 1/2$. D, *Cleistocalyx decussatus*; immature fruits terminating infructescence branchlets, $\times 2$. A from *Smith 7871*, B from *Howard 156*, C from *DA 15740*, D from *DF 310*.

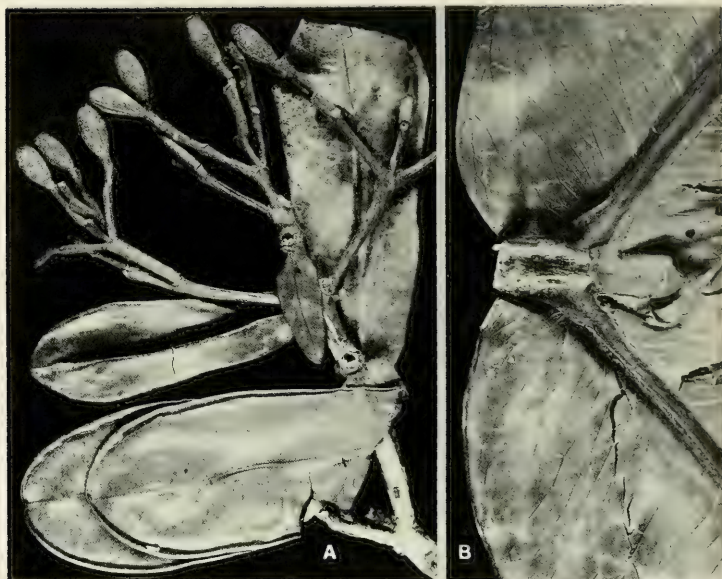


FIGURE 67. *Cleistocalyx decussatus*: A, distal portion of branchlet, with foliage and infructescence, $\times 1/2$; B, lower surfaces of bases of leaf blades, showing costas decurrent on branchlet, $\times 1$. A from DF 310, B from DA 647.

only Fijian species of Myrtaceae known to have distinctively carinate leaf costas excurrent into sharp angles or wings on the branchlet. Flowering or fruiting specimens would presumably be immediately distinguishable, but unfortunately flowers are unknown for *C. decussatus*, as are mature fruits for *S. wolfii*. Sterile material is readily distinguished by the opposite vs. ternate leaves and other foliage characters. *Gillespie 2462* consists of a single, large, detached leaf, which presumably represents a juvenile phase of *C. decussatus* occurring in deep shade; the larger, parenthetical dimensions mentioned below are taken from it. The two remarkable species may be distinguished from one another in sterile condition as follows:

Distal internodes of branchlets sharply 2-angled, 3–10 mm. in diameter; leaves opposite, decussate, sessile (i. e. petioles not distinguishable between leaf costa and branchlet); leaf blades 11–27 (–73) \times 5–13 (–21) cm., narrowly cordate and subamplexicaul at base, rounded or emarginate at apex; principal secondary nerves 25–30 per side, prominulous above, subprominent beneath, the innermost collecting nerve 5–10 (–20) mm. within margin, the reticulation of tertiary nerves and veinlets forming irregular areoles without obvious orientation. *Cleistocalyx decussatus*

Distal internodes of branchlets sharply triquetrous, (5–) 10–15 mm. in diameter; leaves ternate, the adjacent whorls alternating, the petioles essentially none or to 10 mm. long and (8–) 10–14 mm. thick, winged or sharply angled to base; leaf blades (25–) 27–45 \times (9–) 11–21 cm., gradually narrowed proximally and decurrent on petiole or on branchlet, broadly retuse-rounded or abruptly and broadly cuspidate at apex (tip if present to 7 \times 10 mm.); principal secondary nerves 30–40 per side, impressed above or sharply prominulous in blunt depressions or subimmersed, prominent to subimmersed beneath, the innermost collecting nerve 4–8 mm. within margin, the reticulation of tertiary nerves and veinlets forming subquadrangular or irregular areoles predominantly oriented subparallel to secondary nerves.

Syzygium wolfii

12. *Ptilocalyx* Brongn. & Gris in Bull. Soc. Bot. France **12**: 185. 1865; A. C. Sm. in J. Arnold Arb. **36**: 285. 1955, in Pacific Sci. **25**: 495. 1971. Nom. cons.

Trees or shrubs, glabrous throughout, the distal internodes of branchlets slightly flattened but soon terete; leaves opposite, petiolate, the blades coriaceous or subcoriaceous, pinnate-nerved, with an intramarginal collecting nerve sometimes paralleled by an inconspicuous outer nerve; inflorescences terminal, thyrsoidal or metabotryoidal or botryoidal, frondose (lower divisions subtended by leaves), the flowers sessile, the lateral ones of each triad borne on minute distal internodes (anthopodia); flower buds just before rupturing at anthesis obovoid-clavate to turbinate, the hypanthium obconical, often tapering to a slender base, the calyx calyprate, closed, shortly rounded or flattened and minutely umbonate, the completely fused and indistinguishable sepals separating at summit of hypanthial rim by a circumscissile cleft, the hypanthial rim persistent, slightly produced beyond flattened summit of ovary and bearing petals and stamens on its inner margin; petals 4, minute, membranaceous, adherent to the calycine calyptra; stamens numerous, 2(-3)-seriate, strongly inflexed in bud, the filaments filiform, free, the anthers broadly oblong, with divergent locules; ovary 2-locular, with upper-axile placentation, the ovules few (usually 5-12 per locule), dependent from apical angle of locule, the style narrowly conical, the stigma minute; fruits baccate, subglobose to obovoid-globose, smooth (terete in cross section), abruptly contracted at base, rounded at apex and with a shallow, flat or convex depression bordered by the minute, erect or incurved, indurated, persistent hypanthial rim, the style or its base long-persistent, the mesocarp fleshy (but greatly shrinking in drying), the endocarp subligulous; seed 1 (rarely 2?), the cotyledons large, enclosing intrusive and branched placental tissue, the opposing faces ruminant and interlocking.

TYPE SPECIES: *Ptilocalyx robustus* Brongn. & Gris. Typ. cons.

DISTRIBUTION: New Caledonia, the New Hebrides, and Fiji, with about ten species, one of which is endemic to Fiji.

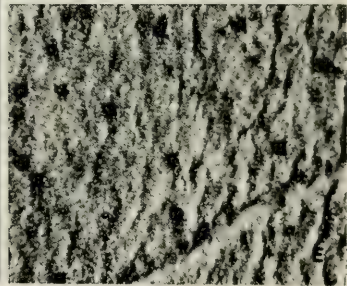
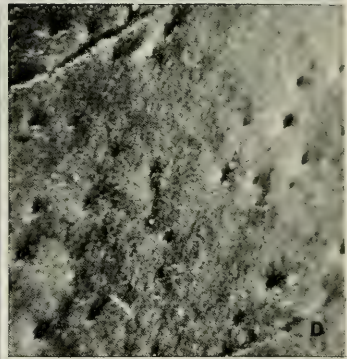
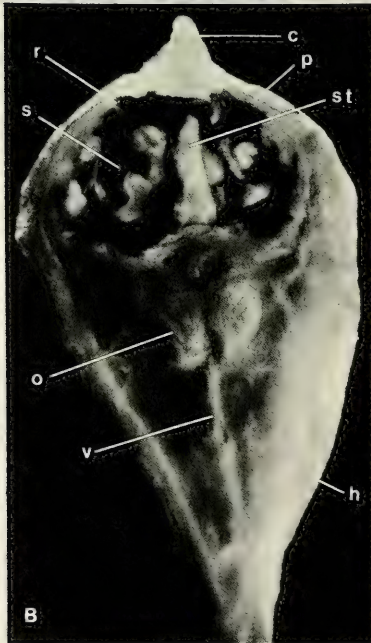
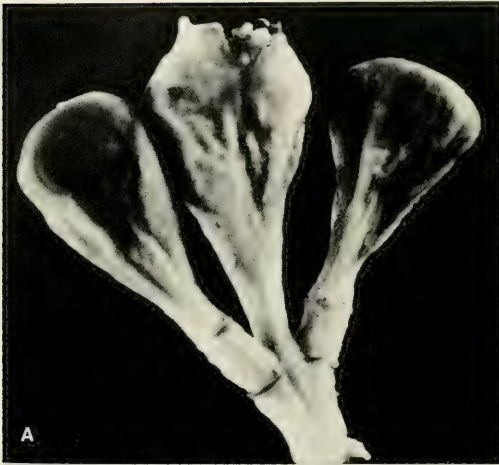
A valuable treatment of the Papuan species of *Acmena* DC. (Hartley, T. G., & L. A. Craven in J. Arnold Arb. **58**: 325-342. 1977) discusses the generic affinities of that genus with *Acmenosperma* Kausel and *Ptilocalyx*, a grouping reflected in the separation of the "*Acmena* suballiance" from the "*Syzygium* suballiance" by Briggs and Johnson (1979, pp. 211, 224-225). Like *Cleistocalyx*, *Ptilocalyx* is readily separable from *Syzygium* by its calyprate calyx; from both *Syzygium* and *Cleistocalyx* it is distinguished by having a placental (or funicular) mass of intercotyledonary material. *Ptilocalyx* may be further distinguished from *Cleistocalyx* by having its calycine calyptra short-rounded- or flattened-umbonate rather than somewhat conical to rostrate, by having the placenta upper-axile rather than elongate-axile and concomitantly with dependent rather than subsending ovules, and by having the mature fruits as broad as or broader than long and never costate.

1. *Ptilocalyx concinnus* A. C. Sm. in Pacific Sci. **25**: 496. 1971. FIGURES 68, 69.

Ptilocalyx wagapensis sensu Perry in J. Arnold Arb. **31**: 370. 1950; A. C. Sm. in op. cit. **36**: 285. 1955; J. W. Parham, Pl. Fiji Isl. **137**. 1964, ed. 2. 198. 1972; non Brongn. & Gris.

A dense-foliaged tree 5-25 m. high, found at elevations of 580-1,150 m. in dense forest or on its edges. The slender petioles are usually 7-15 mm. long, and the elliptic or lanceolate leaf blades are 6-10 x 2-4.7 cm., with a single intramarginal collecting nerve and with the costa and secondary nerves characteristically sharply impressed on the upper surface of dried leaves. The flower buds are white; the fruits turn from cream-colored to dull pink to crimson at maturity and measure up to 16 mm. in diameter (but probably considerably more when fresh). Flowers are known only from the type collection, but fruits have been obtained between February and September.

TIPIFICATION: The type is *Smith 6155* (A HOLOTYPE; many ISOTYPES), collected Sept. 22, 1947, in flower, in hills between Nandala and Nukunuku Creeks, along the



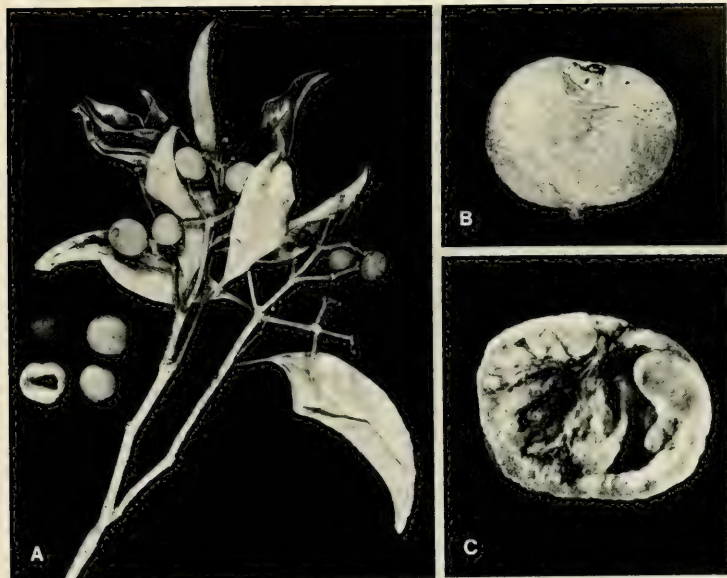


FIGURE 69. *Ptilocalyx concinnus*; A, distal portion of branchlet, with foliage and fruits, one detached fruit broken open, and a seed, $\times 1/2$; B, mature fruit, $\times 2$; C, seed broken open, showing intrusive placental tissue, $\times 4$. A from *Smith 4373*, B & C from *DA 13312*.

trail from Nandarivatu toward Lewa, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from Viti Levu.

LOCAL NAMES: *Yasiyasi*; *yasi ndraundrau*.

AVAILABLE COLLECTIONS: VITI LEVU: Mba: Northern portion of Mt. Evans Range, between Mt. Vatuyanitu and Mt. Natondra, *Smith 4373*; vicinity of Nandarivatu, *Degener 14532*; western and southern slopes of Mt. Tomanivi, *Smith 5118*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 13329*, *DA L.13800* (*DF 1260*); northern portion of Rairaimatuku Plateau, between Nandrau and Nanga, *Smith 5467*. FIJI without further locality, *DA 13312*.

Ptilocalyx had been thought limited to about eight New Caledonian species and the Fijian endemic prior to the report of the occurrence of *P. concinnus* in the New Hebrides by P. S. Green (in Bramwell, *Plants and Islands*, 44, 1979). It is gratifying to have the range of the genus thus filled in, but in my opinion the New Hebridean collections (*Bernardi 13196* and *Beveridge RSNH 3019* from Eromanga and *Gowers NH 157* without locality, all at κ and kindly lent to me by Green) represent an undescribed species. This is probably closer to the Fijian *P. concinnus* than it is to any New Caledonian species, but significant differences may be noted as follows:

FIGURE 68. *Ptilocalyx concinnus*, from *Smith 6155*: A, triad of flowers just before anthesis, $\times 15$; B, longitudinal section of flower bud, showing hypanthium (h), calycine calyptra (c), petals forming a corolline calyptra (p), apex of hypanthial rim (tr), stamens (s), style (st), dependent ovules (o), and axile vascular supply to ovules (v), $\times 30$; C, stamen, $\times 70$; D, portion of upper surface of leaf blade, showing impressed glands, $\times 30$; E, portion of lower surface of leaf blade, showing superficial glands, $\times 30$.

Leaf blades copiously impressed-glandular above and with copious, superficial brown glands beneath; mature flower buds obovoid-clavate, 3.5–5 mm. long but only 1.7–2.5 mm. in diameter, the calyine calyptra 0.7–1.5 mm. in diameter and with an umbo 0.2–0.3 mm. high, the hypanthial rim 0.8–1 mm. high; stamens 30–40, the filaments about 0.5 mm. long; style 0.3–0.8 mm. long. *P. concinnus*

Leaf blades sparsely impressed-glandular above and with few or no superficial glands beneath; mature flower buds broadly turbinate, 4–5 mm. long but 2.4–4 mm. in diameter, the calyine calyptra 1.4–3 mm. in diameter and with an umbo about 0.1 mm. high, the hypanthial rim 1.5–2 mm. high; stamens 50–60, the filaments 1–1.8 mm. long; style 1–1.5 mm. long. *Ptilocalyx* from New Hebrides

13. *EUGENIA* L. Sp. Pl. 470. 1753.

Trees or shrubs, mostly with some parts at least sparingly pilose with unicellular trichomes; leaves opposite, the blades pinnate-nerved; inflorescences axillary, fundamentally racemose, with branches or individual flowers in decussate pairs, the primary axis sometimes greatly shortened and then flowers appearing to be in axillary fascicles, umbels, or glomerules, or flowers, if occasionally solitary, arising from basal bracteate nodes of new branches (these leafy above or abortive), never solitary in leaf axils, the bracteoles at flower bases often broad and persistent, sometimes connate; flowers pedunculate, without anthopodia; hypanthium usually rounded or abruptly narrowed at base, not or insignificantly produced beyond summit of ovary; sepals 4, imbricate, free to base or there loosely coherent, usually persistent in fruit; petals 4, usually conspicuous and spreading; stamens numerous, incurved in bud; disk comparatively thin; ovary 2-locular, the ovules (2-) several or many per locule, usually attached near middle of dissepiment, the style comparatively short, usually less than twice as long as petals; vascular supply to ovules strictly transeptal; fruits with a thin and easily crushed pericarp when dried, the seeds 1 or 2, the testa thin, membranaceous, smooth, the cotyledons completely fused into a homogeneous embryo.

LECTOTYPE SPECIES: *Eugenia uniflora* L. (vide Britton & Millspaugh, Bahama Fl. 303. 1920), one of Linnaeus's five original species. Choice of a lectotype species is further discussed by Merrill and Perry (in Mem. Amer. Acad. Arts 18: 135. 1937). The generic designation *Eugenia* was originated by Micheli (Nov. Pl. Gen. 226. t. 108. 1729), whose description and illustration refer to *E. uniflora*, which is also represented by an actual specimen at LINN. The other four species of Linnaeus (1753) do not fall into *Eugenia* in the sense of *E. uniflora*.

DISTRIBUTION: Tropical and subtropical America, with 500 or more species. Two species are recorded as cultivated in Fiji, one of them sparsely naturalized.

KEY TO SPECIES

- Petioles slender, 1–3 mm. long; leaf blades papyraceous to chartaceous, ovate, 2.5–6 × 1.5–3.5 cm., obtuse to rounded at base, obtusely short-acuminate at apex; peduncles slender, 1.5–3.5 cm. long; fruits obovate- or ovoid-globose, 2–3 cm. in diameter, with 8 longitudinal furrows. 1. *E. uniflora*
- Petioles stout, 5–15 mm. long; leaf blades coriaceous, elliptic to obovate-oblong, 6–15 × 2.5–7 cm., attenuate at base, obtuse at apex; peduncles comparatively stout, 2.5–5 cm. long; fruits subglobose, about 2 cm. in diameter, smooth. 2. *E. brasiliensis*

1. *Eugenia uniflora* L. Sp. Pl. 470. 1753; Yuncker in Bishop Mus. Bull. 178: 91. 1943; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 130. 1970.

Eugenia michelii Lam. Encycl. Méth. Bot. 3: 203. 1789; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 100, as *E. micheli*. 1948.

A shrub or small tree occasionally cultivated near sea level and perhaps sparingly naturalized. The inflorescences are composed of 1–3 flowers with white petals that open to 12–15 mm. in diameter; the fruits turn from yellow to bright red and at length to dark purple.

TIPIFICATION AND NOMENCLATURE: The species is presumably to be typified by the specimen (LINN) which was available to Linnaeus in 1753 (cf. discussion under the

genus), although it would also be reasonable to take Micheli's 1729 illustration as the holotype. *Eugenia michelii* was based on a plant growing in the Jardin du Roi, considered by Lamarck to differ in leaf shape from *E. uniflora*.

DISTRIBUTION: The Guianas to Brazil and Argentina, now widely cultivated elsewhere.

LOCAL NAMES AND USES: *Surinam cherry*; *Barbados cherry*; *pitanga* (Brazilian). The acid fruits are edible fresh and are also used to make jellies, sherbets, etc. The species is also a desirable ornamental.

No herbarium vouchers are available, but *Eugenia uniflora* was growing in the Suva Botanical Gardens in 1948 and is frequently seen in private gardens in Suva. It is said occasionally to escape and become naturalized.

2. *Eugenia brasiliensis* Lam. Encycl. Méth. Bot. 3: 203. 1789; J. W. Parham, Pl. Fiji Isl. 137. 1964, ed. 2. 197. 1972.

(?) *Eugenia* sp. J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 100. 1948.

A tree to 15 m. high where indigenous, cultivated only near sea level. The flowers, with white petals, spread to 15–18 mm. in diameter, and the fruits are dark red, eventually becoming black.

TYPEFICTION: The type is a *Dombey* specimen in Herb. Jussieu (P), said to have come from Brazil.

DISTRIBUTION: Brazil and perhaps elsewhere in South America, now widely cultivated in tropical countries.

LOCAL NAMES AND USES: *Brazilian cherry*; *Brazilian plum*; *Spanish cherry*; *grumixameira* (Brazilian). Like the preceding, *Eugenia brasiliensis* is an ornamental bearing fruits that are edible fresh and may also be used for jellies, preserves, etc.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Nasinu Experiment Station, DA 1544, 5528.

This species may first have been introduced by J. B. Thurston, who listed it in his 1886 *Catalogue*. It is sometimes listed as *Eugenia dombeyi* (Spreng.) Skeels (in U. S. Dept. Agr. Pl. Indust. Bull. 233: 51. 1912), based on *Myrtus dombeyi* Spreng. (Syst. Veg. 2: 485. 1825), but Sprengel's name would seem illegitimate because *E. brasiliensis* was cited in synonymy. There seems no obstacle to using Lamarck's binomial.

14. *Jossinia* Commerson ex DC. Prodr. 3: 237. 1828; Merr. in J. Arnold Arb. 31: 329. 1950, in Philipp. J. Sci. 79: 356. 1950.

Trees or shrubs, closely related to *Eugenia* in basic characters but differing in having the inflorescences usually fasciculate in leaf axils, with 1–3 flowers, or fasciculate on branchlets below leaves and with (1–) 2–10 flowers (or perhaps racemose in some species); flowers often larger than in *Eugenia*, the disk broad, thick, cushionlike; ovary similarly 2-locular but the ovules numerous, up to 25 or more per locule; vascular supply to ovules transeptal but also with a few bundles axile in origin (entering via bases of septa); seeds (1–) 2–6 (or more?), the testa usually thick or subligneous but sometimes membranaceous or chartaceous, the cotyledons connate but with opposing faces not fused (but said to be sometimes partially or completely fused).

LECTOTYPE SPECIES: *Jossinia tinifolia* (Lam.) DC. (*Eugenia tinifolia* Lam.) (vide A. J. Scott in Kew Bull. 34: 474. 1979). Although he did not maintain *Jossinia* as distinct from *Eugenia*, Scott chose *J. tinifolia* as its lectotype species, appropriately since it is the most readily recognized species among the eight originally included in *Jossinia* by

de Candolle (seven presumably from the Mascarene Islands and one from Madagascar). No lectotype species seems to have been previously chosen (ING, 1979). Ashton (in Rev. Handb. Fl. Ceylon 2: 408. 1981), who also submerges *Jossinia* in *Eugenia*, states without elaboration that *J. cotinifolia* (Jacq.) DC. is the type species of the former genus. That this would be an inappropriate choice had already been discussed by Scott (1979, p. 475), who suggests that the holotype of *Eugenia cotinifolia* Jacq., now lacking flowers and fruits, very probably belongs to a New World species of *Eugenia*.

DISTRIBUTION: Tropical Africa and Indian Ocean islands to India, throughout Malasia to Micronesia and northeastern Australia, and eastward in the Pacific to the Tuamotus and Hawaii, probably with 50 or more species. One widespread, usually littoral species is indigenous in Fiji.

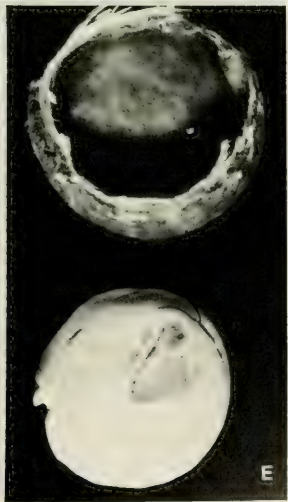
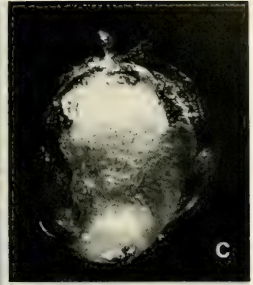
USEFUL TREATMENT OF GENUS: MERRILL, E. D. On the synonymy of *Jossinia reinwardtiana* (Blume) Blume. J. Arnold Arb. 31: 329-333. 1950.

Schmid's (1972: in Amer. J. Bot. 59, in J. Arnold Arb. 53) studies took into consideration only two Old World species of *Jossinia*. He concluded that "All the evidence from both vegetative and reproductive organography and anatomy now available demonstrates that *Jossinia* is so very similar to the American species of *Eugenia s. s.* that segregation of *Jossinia* as a genus seems unwarranted." Nevertheless, the placental vasculature of *J. aherniana* (C. B. Robinson) Merr. (the only Old World species of this immediate relationship studied in detail) is supplied not only transeptally but also by a few bundles entering from the base of the septum, although the characteristically massive axile strand of *Syzygium sensu lat.* is lacking. This situation caused Schmid to suggest that "*Jossinia* may well represent a residue of Old World species of *Eugenia s. s.* that, in some of its taxa, exhibits a rather primitive transeptal ovular system, one perhaps transitional between the axile ovular system of the Old World *Syzygium s. l.* and the transeptal ovular system of the New World species of *Eugenia s. s.*"

It is thus apparent that *Jossinia* (although insufficiently studied from the viewpoint of floral anatomy) is not quite as definitely reducible to *Eugenia* as assumed by most present-day taxonomists (Briggs and Johnson, 1979; Scott, 1979; Ashton, 1981). But when the point made by Schmid is taken in conjunction with more superficial trends (none of them very convincing in itself), and when such facts are added to the geographic separation of the two groups, perhaps one may take them as discrete genera with a degree of logic. *Eugenia* with the inclusion of *Jossinia* would be the only genus of Myrtaceae indigenous in both the Western and Eastern Hemispheres. To recognize *Jossinia* as distinct serves to make the hemispheric independence of myrtaceous genera unanimous.

Merrill (1950, in both references above) was perhaps the first modern taxonomist to suggest such a hemispheric distinction between the distributions of *Eugenia* and *Jossinia*. But he expressed some reservations as to the strict identity of Blume's (*Mus. Bot. Lugd.-Bat.* 1: 119. 1850) and Diels's (in *Bot. Jahrb.* 56: 531. 1921, in op. cit. 57:

FIGURE 70. *Jossinia reinwardtiana*; A, distal portion of branchlet, with foliage and inflorescences, the flowers past anthesis, $\times 1/3$; B, flower, with a detached petal, $\times 4$; C, mature, water-soaked fruit with disintegrating pericarp, a sepal still persistent, $\times 2$; D, 4 seeds and vascular network within a water-soaked, decaying pericarp, a sepal still persistent, $\times 2$; E, seed broken open to show thick, fibrous testa, and an embryo, the cotyledons appressed and perhaps partially connate but with a line of separation, $\times 4$. A & B from *Smith 1511*, C-E from *DA 16852*.



376. 1922) concept of *Jossinia* with the original concept of de Candolle. However, a review of the Mascarene species placed in *Eugenia* by Scott (in Kew Bull. 34: 474-483. 1979) indicates that *Jossinia*, if accepted at the generic level, may include most or all of the Old World "leftover" species of *Eugenia* sensu lat. after the removal of *Syzygium* and other obviously distinct genera of the *Acmena* alliance (sensu Briggs and Johnson, 1979).

1. *Jossinia reinwardtiana* (Bl.) Bl. Mus. Bot. Lugd.-Bat. 1: 120. 1850; Merr. in J. Arnold Arb. 31: 330. 1950. FIGURE 70.

Myrtus reinwardtiana Bl. Bijdr. Fl. Ned. Ind. 1082. 1826.

Eugenia reinwardtiana DC. Prodr. 3: 267. 1828.

Eugenia rariflora Benth. in London J. Bot. 2: 221. 1843; A. Gray Bot. U. S. Expl. Exped. 1: 514. 1854, Atlas, pl. 60, A. 1856; Seem. in Bonplandia 9: 256. 1861, Viti, 436. 1862, Fl. Vit. 78. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 170. 1890; Guillaumin in J. Arnold Arb. 12: 255. 1931; Christophersen in Bishop Mus. Bull. 154: 19. 1938; Yuncker in op. cit. 178: 91. 1943, in op. cit. 220: 201. 1959; J. W. Parham, Pl. Fiji Isl. 137. 1964, ed. 2. 197. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 129. 1970.

As seen in Fiji, *Jossinia reinwardtiana* is a tree or shrub 1-5 m. high, often spreading or slender, frequently abundant in littoral forest, along rocky coasts, and on dry rocky slopes near the sea, sometimes on river banks but never far inland, at elevations from near sea level to 350 m. The young branchlets, foliage, and inflorescences are short-pale-sericeous, usually soon glabrate but sometimes with subsistent indument on fruits. The leaves have petioles 2-6 mm. long and coriaceous, broadly ovate to elliptic or obovate blades (2.5-) 4-8 × (1.5-) 2-6.5 cm., rounded to acute at base, obtuse to rounded or faintly emarginate at apex. The peduncles are 5-25 mm. long, solitary or paired in leaf axils or occasionally 3-6 borne on short leafless branchlets simulating racemes. Flowers have the hypanthium ovate-subglobose, the sepals imbricate in bud and in slightly unequal pairs, elliptic-oblong, rounded, up to 5 × 4 mm., and the petals white, ovate to oblong, up to 8 mm. long, and early caducous. Fruits are subglobose, 12-20 mm. in diameter, yellow to bright orange to brownish, with persistent sepals, the subglobose seeds being often (2 or) 3 or 4, but sometimes only 1. Flowers have been collected between January and July, fruits seeming to mature several months later.

TYPIFICATION AND NOMENCLATURE: *Myrtus reinwardtiana* was described on the basis of *Reinwardt* (SYNTYPES at L), collected on the small islands Pulo Pombo, near Amboina, and Saparua, between Amboina and Ceram. *Eugenia rariflora* is based on *Hinds & Barclay* (K HOLOTYPE, 3 sheets; ISOTYPE at BM), collected between May 30 and June 14, 1840, on Nukulau Island, Rewa Province, Viti Levu. The three K sheets are labelled as (1) *Barclay*, Nukulau, and (2, 3) *Hinds*, without locality; these appear to be identical parts of the same collection. The BM sheet is *Barclay 3426*, from Nukulau and doubtless another part of the same collection. Other synonyms of this widespread species are listed by Merrill (1950).

DISTRIBUTION: Borneo and the Kangean Islands eastward through Malesia to Micronesia, the Tuamotus, and Hawaii. In Fiji it is to be expected on most of the islands in an appropriate littoral habitat, but all available collections are listed below. The fruits or seeds of this predominantly coastal species must be readily dispersed by seawater.

LOCAL NAME: In spite of its abundance, no Fijian name seems to be firmly associated with this species, the following having been recorded only once each and probably questionable: *misimisi* (Mathuata); *tomitomi*, *kavika ni Viti*, and *nggainggai* (Thakaundrove).

AVAILABLE COLLECTIONS: VITI LEVU: MBA: North of Lomolomo, *Degener & Ordonez 13637*. NANDRONGA & NAVOSA: Vicinity of Singatoka, *Greenwood 776*. REWA: Lami quarry, *DA 937*. OVALAU: North of Levuka, *Gillespie 4489*. KORO: West coast, *Smith 1074*. NAIRAI: *Tohill 149C*. NGAU: Nggarani, *Tohill 149*; shore of Herald Bay, vicinity of Sawaieke, *Smith 7902*. VANUA LEVU: MBUA: Naivakasinga district, *H. B. R. Parham 389*; Nandi Bay, *Milne*. MATHUATA: Ndreketi River, *DA 15278*; along Mathuata coast, *Greenwood 671*; Undu Point, *Tohill 149A*. THAKAUNDOVE: Namale, *DA 16852*; along Hibiscus Highway east of Savusavu, *Bierhorst F160*; Maravu, near Salt Lake, *Degener & Ordonez 14217*; Mbutha Bay area, *Howard 246*; hills west of Mbutha Bay, Natewa Peninsula, *Smith 805*. VANUA LEVU without further locality, *H. B. R. Parham 33*. TAVEUNI: *Seemann 160*. VANUA MBALAVU: Northern limestone section, *Smith 1511*. FIJI without further locality, *U. S. Expl. Exped., Horne 304, 388, 715*.

FAMILY 129. PUNICACEAE

PUNICACEAE Horan. Prim. Lin. Syst. Nat. 81. 1834.

Shrubs or small trees, sometimes spiny, estipulate, the young twigs narrowly 4-winged, soon becoming terete; leaves opposite or subopposite, sometimes congested at apices of branchlets, the blades simple, entire, eglandular; inflorescences terminal and axillary, the flowers solitary or fasciculate, ♂, actinomorphic, epigynous, the hypanthium prolonged beyond ovary; sepals 5-8, valvate; petals 5-8, alternate with sepals, imbricate and crumpled in bud; stamens numerous, borne on inner surface of hypanthial tube, the filaments free, slender, the anthers small, 2-locular, dorsifixed, dehiscing lengthwise; ovary inferior, (3-) 7-9 (-15)-locular, the locules (in our species) superposed in 2 (or 3) series, the lower series with axile placentation, the upper series with seemingly parietal placentation due to asymmetric development, the ovules numerous on each placenta, anatropous, the style slender, simple; fruits baccate, the sepals persistent, the pericarp leathery, the seeds numerous, embedded in pulp derived from sarcotestas, the endosperm lacking, the cotyledons large, convolute.

DISTRIBUTION: Eurasia from the Balkan area to northern India, and also Socotra Island, with a single genus of two species.

1. PUNICA L. Sp. Pl. 472. 1753.

The sole genus of the family.

TYPE SPECIES: *Punica granatum* L., the only original species.

DISTRIBUTION: As of the family; *Punica granatum* is now widely cultivated outside its original range and is occasionally grown in Fiji.

1. *Punica granatum* L. Sp. Pl. 472. 1753; Christophersen in Bishop Mus. Bull. 128: 154.

1935; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 116. 1939; Yuncker in Bishop Mus. Bull. 178: 88. 1943; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 101. 1948; Yuncker in Bishop Mus. Bull. 220: 196. 1959; J. W. Parham, Pl. Fiji Isl. 144. 1964, ed. 2. 206. 1972; Purselglove, Trop. Crops, Dicot. 641. fig. 99. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 172. 1970; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 66, 107. 1972.

As seen in Fiji, *Punica granatum* is a sometimes compact shrub or a small tree 2-6 m. high, occasionally cultivated near sea level. Its leaf blades are elliptic to oblanceolate and usually 4-8 cm. long; the striking flowers, 4-6 cm. in diameter, have bright red or orange-red, obovate to suborbicular petals 1.5-2.5 cm. long; and the fruits are spherical, 5-13 cm. in diameter, brownish yellow to red, with numerous seeds embedded in pinkish, juicy pulp. Flowers persist for a long period, at least from September to March.

TYPIFICATION: Several references were given by Linnaeus, among which I have not noted a lectotypification.

DISTRIBUTION: The pomegranate, perhaps a cultigen, is recorded as growing wild in the area from the Balkans to northern India, but perhaps it was first developed in Iran or a neighboring country. It is now widely cultivated (and sometimes naturalized) in other tropical and warm temperate areas. In Fiji it was probably a fairly early European introduction, listed in J. B. Thurston's 1886 *Catalogue*.

LOCAL NAME AND USES: The usual name, *pomegranate*, is applied in Fiji, where the species is grown as a garden ornamental. The pulp of the fruit is acidulous and is edible without preparation, or it may be used as a salad or made into beverages. The wood is hard and is considered useful, and various parts of the plant are used medicinally. An interesting account of the history and uses of the pomegranate is provided by Burkill (*Dict. Econ. Prod. Malay Penins.* ed. 2. 1871-1875. 1966).

AVAILABLE COLLECTION: VITI LEVU: REWA: Suva, in private garden, DA 16774. B. E. V. Parham (1939, cited above) noted fruiting specimens on Tovu Island, Ra Province, Viti Levu, and J. W. Parham (1948) recorded the plant as growing in the Suva Botanical Gardens, although no herbarium vouchers support these records.

FAMILY 130. ONAGRACEAE

ONAGRACEAE Juss. Gen. Pl. 317, as *Onagrae*. 1789.

Herbs or shrubs, infrequently trees, lacking stipules or these rarely present and small; leaves alternate, opposite, or whorled, the blades simple, sometimes lobed or pinnatifid, entire or serrate; inflorescences axillary or terminal, spicate, racemose, or paniculate, sometimes 1-flowered, the flowers usually actinomorphic, ♂, seldom unisexual, epigynous, usually 4-merous, often protandrous, the hypanthium usually elongate; sepals valvate, usually 4 (2-7), borne on hypanthial rim; petals usually as many as sepals, imbricate, valvate, or convolute, often clawed or stipitate, rarely lacking; stamens usually twice as many as sepals, sometimes as many, rarely fewer, borne within hypanthium or surrounding an epigynous disk, the anthers 2-locular, usually versatile, dehiscing longitudinally; ovary inferior, the locules usually as many as sepals or sometimes with incomplete partitions, the placentation usually axile, sometimes parietal, the ovules numerous or several (rarely 1 or 2) on each placenta, anatropous, the style simple, the stigma capitate or globose, often lobed; fruit usually a loculicidal capsule, sometimes a berry or nut, the seeds numerous or few (rarely only 1), the endosperm scanty or lacking, the embryo straight.

DISTRIBUTION: Temperate, subtropical, and tropical areas, best developed in America, with about 17 genera and more than 600 species. A single genus occurs in Fiji.

1. LUDWIGIA L. Sp. Pl. 118, as *Ludvigia*. 1753; corr. L. Gen. Pl. ed. 5. 55. 1754; Baill. Hist. Pl. 6: 463. 1877; Raven in Reinwardtia 6: 330. 1963, in Fl. Males. I. 8: 99. 1977.

Jussiaea L. Sp. Pl. 388. 1753; Brenan in Kew Bull. 8: 163. 1953.

Shrubs or slender herbs, erect or creeping and rooting at nodes; leaves alternate or opposite, the blades usually entire; flowers solitary or borne in inflorescences, with or without 2 bracteoles at or near base of ovary, the hypanthium not prolonged beyond ovary; sepals 3-7, persistent; petals as many as sepals or absent, with convolute aestivation, caducous; stamens as many as or twice as many as sepals (rarely intermediate in number), the anthers usually versatile but sometimes appearing basifixed; disk epigynous, flat to conical, often with depressed nectaries around bases of stamens; ovary locules as many as sepals, rarely more, the placentation axile, the ovules pluriseriate or uniseriate, the stigma hemispherical or capitate, often lobed; fruit a

capsule, dehiscent irregularly or by a terminal pore or by flaps separating from the valvelike top, the seeds rounded to elongate, sometimes embedded in powdery or woody endocarp.

LECTOTYPE SPECIES: The lectotype species of *Ludwigia* is *L. alternifolia* L. (vide Britton & Brown, Ill. Fl. N. U. S. ed. 2: 586. 1913); that of *Jussiaea* is *J. repens* L. (vide Britton & Brown in op. cit. 589. 1913). The genera were first combined by Baillon (1877, cited above), who utilized the name *Ludwigia*.

DISTRIBUTION: Pantropical, subtropical, and temperate, possibly originating in the New World but with a secondary center in Africa, and with about 75 species. Spread of the genus into Malesia and the Pacific has probably been relatively recent. It is significant that no Fijian collections or records are earlier than the present century, and one must assume that all three species that occur there are recent, presumably inadvertent introductions.

LOCAL NAMES: Names used for any of the species found in Fiji are *nainggisa* (*naingisa*), *lalakawaivou* (*lalakowaivou*, *lalakaivou*), *false primrose*, *willow primrose*, and *yellow willow herb*.

USEFUL TREATMENTS OF GENUS: RAVEN, P. H. The Old World species of *Ludwigia* (including *Jussiaea*), with a synopsis of the genus (Onagraceae). *Reinwardtia* 6: 327-427. 1963. RAVEN, P. H. *Ludwigia*. Fl. Males. I. 8: 99-107. 1977.

KEY TO SPECIES

Seeds free, not embedded in endocarp, pluriseriata; sepals 4, ovate or lanceolate, 6-13 × 1-7.5 mm.; petals broadly obovate or cuneate, emarginate, 5-17 × 4-17 mm.; leaf blades lanceolate to ovate, 2-14.5 × 0.4-4 cm. 1. *L. octovalvis*

Seeds embedded in endocarp and uniseriate at least below; sepals 4 or 5.

Plants erect; sepals 4, lanceolate, 2-4 × 0.7-1.2 mm.; petals elliptic, 2-3 × 1-2 mm.; leaf blades lanceolate, 1-9 × 0.2-3 cm.; seeds in approximately the upper quarter of capsule pluriseriata and free.

2. *L. hyssopifolia*

Plants of wet places, with stems sprawling and rooting at nodes or floating; sepals 5, deltoid-acuminate, 4-7 × 1.5-2 mm.; petals obovate, 7-14 × 4-10 mm.; leaf blades oblong to oblong-spathulate, 1-6 × 0.5-2 cm.; seeds all uniseriate and embedded in endocarp. 3. *L. peploides*

1. *Ludwigia octovalvis* (Jacq.) Raven in *Kew Bull.* 15: 476. 1962, in *Reinwardtia* 6: 356. 1963; Munz in *N. Amer. Fl. II.* 5: 33. 1965; Raven in *Fl. Males. I.* 8: 101. *fig. 1.* 1977.

In his 1963 treatment Raven recognized three subspecies in the Old World, but in 1977 in *Flora Malesiana* he did not differentiate these, remarking: "In my revision (1963) I distinguished three subspecies, more or less geographically defined, which I wish to withdraw here." In the earlier treatment (in *Reinwardtia* 6: 356-365. 1963) Raven had discussed the sharply distinct typical forms of subsp. *octovalvis* and subsp. *sessiliflora*, acknowledging that numerous intermediates exist between them but pointing out pronounced differences in their Pacific distributions. The two subspecies are readily distinguished in Fiji and adjacent areas and their use has become established in post-1963 literature, hence I prefer not to dismiss them as nonexistent entities. Even if they may not merit subspecific status, I believe that the two forms deserve recognition at some level. Their complex synonymies are listed in detail by Raven (1963).

KEY TO SUBSPECIES

Plants subglabrous or with sparse or dense appressed pubescence; leaf blades lanceolate to narrowly ovate, 3-14.5 × 0.4-4 cm. 1a. subsp. *octovalvis*

Plants with long, spreading pubescence, at least in distal parts; leaf blades lanceolate to subovate, 2-10 × 0.8-4 cm. 1b. subsp. *sessiliflora*

1a. *Ludwigia octovalvis* subsp. *octovalvis*; Raven in *Reinwardtia* 6: 357. fig. 19, 20. 1963; Munz in *N. Amer. Fl. II*. 5: 33. 1965; J. W. Parham, *Pl. Fiji Isl.* ed. 2. 318. 1972; B. E. V. Parham in *New Zealand Dept. Sci. Indust. Res. Inform. Ser.* 85: 37, 52, 80. 1972; St. John in *Phytologia* 36: 372, as *L. octivalvis* subsp. *octivalvis*. 1977.

Oenothera octovalvis Jacq. *Enum. Syst. Pl. Carib.* 19. 1760.

Jussiaea octovalvis Sw. *Obs. Bot.* 142. 1791.

Jussiaea erecta sensu Setchell in *Carnegie Inst. Wash. Publ.* 341: 61. 1924; Christophersen in *Bishop Mus. Bull.* 128: 160. 1935; A. C. Sm. in *Sargentia* 1: 95. 1942; Greenwood in *J. Arnold Arb.* 25: 399. 1944; Yuncker in *Bishop Mus. Bull.* 184: 55. 1945, in op. cit. 220: 206. 1959; J. W. Parham in *Dept. Agr. Fiji Bull.* 35: 52. 1959, *Pl. Fiji Isl.* 228. 1964; non L.

The typical subspecies of *Ludwigia octovalvis* occurs in Fiji at elevations from near sea level to 800 m. as a coarse herb or shrub 0.3–1 m. high, sometimes with reddish stems and purple-tinged leaves, along streams in dry areas and on edges of ponds and in shallow water in open country. Often it is an abundant weed in coconut plantations, canefields, ricefields, pastures, and along roadsides. The sepals are reddish-tinged and the petals are yellow or pale yellow. Flowers and fruits are found throughout the year.

TYPIFICATION: The type was collected in the West Indies by Jacquin but is probably no longer extant (Raven, 1963).

DISTRIBUTION: West Indies and Mexico to Peru and Paraguay, and in the Old World from Africa (uncommon) through India and southern China and into Malesia and northern Australia; scattered throughout the Pacific to the Societies, Marquesas, and Hawaii. In Fiji it is thus far known from four islands but should be anticipated on others; I have examined 34 collections.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Teindamu River, *DA 11143*; Lautoka, *Greenwood*, Apr. 5, 1943; Nandi airport, *DA 10678*; Korovou, east of Tavua, *Degener 14963*; Nandarivatu, *DA 2115*. SERUA: Tokotoko, Navua, *DA 9442*. NAMOSI: Queen's Road near Melimeli, *DA 10094*. RA: Colonial Sugar Refining Co., Yanggara, *DA 11860*. NAITASIRI: Vunindawa, *DA 10010*; Principal Agricultural Station, Koronivia, *DA 10069*; vicinity of Nasinu, *Gillespie 3418*. REWA: Suva, *DA 3120*. OVALAU: Valley of Mbureta and Lovoni Rivers, *Smith 7494*. VANUA LEVU: MBUA: Nambouwalu, *DA 1097*. MATHUATA: Ndreketi River, *DA 1105*; Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, *Smith 6884*; Lambasa, *Greenwood 587* (May 27, 1923; earliest collection seen). THAKAUNDRIVE: Nakoroutari, south of Lambasa, *DA 11775*. TAVEUNI: Waitavala Estate, *DA 8896*, p. p.

1b. *Ludwigia octovalvis* subsp. *sessiliflora* (M. Micheli) Raven in *Kew Bull.* 15: 476. 1962, in *Reinwardtia* 6: 362. fig. 3. 1963; Munz in *N. Amer. Fl. II*. 5: 34. 1965; J. W. Parham, *Pl. Fiji Isl.* ed. 2. 318. 1972.

Jussiaea suffruticosa L. *Sp. Pl.* 388. 1753; A. C. Sm. in *Sargentia* 1: 96. 1942; Greenwood in *Proc. Linn. Soc.* 154: 98. 1943; J. W. Parham in *Dept. Agr. Fiji Bull.* 35: 52. fig. 20. 1959, *Pl. Fiji Isl.* 228. 1964.

Jussiaea octonervia f. *sessiliflora* M. Micheli in *Mart. Fl. Bras.* 13 (2): 171. 1875.

Jussiaea octonervia var. *sessiliflora* M. Micheli in *Mart. Fl. Bras.* 13 (2): 180. t. 35. 1875.

Subspecies *sessiliflora* in Fiji is a coarse herb or shrub 0.3–2 m. high occurring from near sea level to about 900 m. in essentially the same habitats as subsp. *octovalvis* but also occasionally in forest. Its flowers are essentially similar but the petals are often a brighter yellow, and similarly flowers and fruits do not seem to be seasonal.

TYPIFICATION AND NOMENCLATURE: *Jussiaea suffruticosa* was typified by material from India, apparently lost (Raven, 1963, p. 362). Micheli's epithet *sessiliflora* provides the oldest available epithet at a trinomial level; its type is *Burchell 927* (K HOLOTYPE; ISOTYPE at GH).

DISTRIBUTION: Trinidad and Tobago to Brazil, and in the Old World from southern Africa and Madagascar into India, southern China, and southern Japan and through Malesia to northern Australia and eastward to Fiji. In Fiji 60 collections have been examined from four islands, but it is surely to be found on many others.

USE: In Naitasiri Province a dye has been prepared from the roots.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Teindamu River, *DA 11142*; Lautoka, *Greenwood 156* (Sept., 1920; earliest collection seen); vicinity of Nandi, *DA 9719*; Nalotawa, eastern base of Mt. Evans Range, *Smith 4436*; Nandarivatu, *Parks 20734*. NANDRONGA & NAVOSA: Keiyasi, Singatoka River, *DA 10172*. SERUA: Mt. Tuvutau, *DA 14619*; Tokotoko, Navua, *DA 10551*. NAMOSI: Valley of Wainavindrau Creek, vicinity of Wainimakutu, *Smith 8816*; Wainandoi River, *DA 14342*. RA: Pasture Seed and Production Farm, Ndombulevu, *DA 9524*. NAITASIRI: Waindravo Creek, near Vunindawa, *DA 9922*; Plant Introduction and Quarantine Station, Nanduruloulou, *DA 9570*; Tamavua, *Gillespie 2114*. TAILEVU: Vicinity of Ndakuivuna, Wainimbuka River, *Smith 7011*; Matavatathou, *DA 9936*; Wainimbokasi River, *DA 10575*. REWA: Suva, *H. B. R. Parham 313*. TAVEUNI: Waitavala Estate, *DA 8896*, p. p. VANUA MBALAVU: Central volcanic section, near Lomaloma, *Smith 1406*. LAKEMBA: Near Tumbou Village, *Garnock-Jones 925*.

2. *Ludwigia hyssopifolia* (G. Don) Exell in Garcia de Orta **5**: 471. 1957; Raven in Reinwardtia **6**: 385, fig. 30. 1963; J. W. Parham, Pl. Fiji Isl. ed. 2. 318. 1972; Raven in Fl. Males. I. **8**: 104, fig. 4. 1977.

Jussiaea linifolia Vahl, Ecl. Amer. 2: 32. 1798; non *Ludwigia linifolia* Poir. (1813).
Jussiaea hyssopifolia G. Don, Gen. Hist. Dichlam. Pl. 2: 693. 1832.

In Fiji *Ludwigia hyssopifolia* occurs locally at low elevations as a naturalized weed 0.5–1 m. high, found along roadsides, in ricefields, and in other wet places. It may be in flower at any season.

TYPEFICTION AND NOMENCLATURE: The type of *Jussiaea linifolia* Vahl is *von Rohr* (C HOLOTYPE), from "America meridionali." The epithet is not available for this taxon in *Ludwigia*. *Jussiaea hyssopifolia* is typified by *G. Don 42* (BM HOLOTYPE), collected in 1822 on the island of São Tomé in the Gulf of Guinea, Africa. Other synonymy is indicated by Raven (1963, 1977).

DISTRIBUTION: The place of origin of this pantropical weed is uncertain; it is relatively local in Africa and the Cape Verde Islands, also occurring from Ceylon, India, and southern China throughout Malesia to Micronesia and northern Australia, with apparently recent populations in Fiji and Samoa.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Korongganga, near mouth of Mba River, *DA 10825*. NAITASIRI: Nanduruloulou, *DA 10050*; Koronivia, *DA 6025*; Principal Agricultural Station, Koronivia, *DA 11736*, *L.10508*.

3. *Ludwigia peploides* (H. B. K.) Raven in Reinwardtia **6**: 393. 1963, in Fl. Males. I. **8**: 100. 1977.

Jussiaea peploides H. B. K. Nova Gen. et Sp. 6: 97. 1823.

In proposing this combination in 1963 Raven indicated the species to consist of four distinct geographical entities; three of these occur in the Old World, but only one extends into the Pacific, subsp. *peploides*.

3a. *Ludwigia peploides* subsp. *peploides*.

Sprawling herb with stems rooting at nodes or floating, apparently very sparingly naturalized as a weed in wet places in Fiji near sea level. The petals are yellow or bright golden-yellow, with a darker spot at base. Flowers were noted in May.

TYPEFICTION: The type is *Humboldt & Bonpland* (P HOLOTYPE), obtained near Ibagué, Dept. Tolima, Colombia.

DISTRIBUTION: In the New World from southern U. S. to Argentina and sparingly introduced into the Old World; previously known in the Pacific from the Cook, Society, and Austral Islands.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Nasinu Experiment Station, *DA 1541*. FIJI without further locality, *DA 3906*.

FAMILY 131. MELASTOMATACEAE

MELASTOMATACEAE Juss. Gen. Pl. 328, as *Melastomae*. 1789.

Herbs, shrubs, trees, or lianas, with opposite branching, the branches often quadrangular, the stipules lacking or vestigial; leaves opposite (and sometimes unequal) or verticillate, often decussate, simple, the blades usually entire and with 3-9 or more longitudinal nerves oriented from or near base, rarely penninerved; inflorescences basically cymose but variable; flowers ♂, rarely unisexual, usually actinomorphic, partly or entirely epigynous, often showy; hypanthium campanulate to tubular, free from or adnate to ovary, sometimes by means of longitudinal septa. the calyx lobes imbricate or rarely valvate, sometimes inconspicuous; petals dextrorsely contorted in bud, inserted on hypanthial rim; stamens usually the same number as petals or (as in all our species) twice as many, but sometimes fewer or more numerous, the filaments free, often geniculate and inflexed, the anthers 2-locular, basifixed or dorsifixed, dehiscent by 1 or 2 terminal pores or by longitudinal clefts, the connective often thickened proximally and produced beyond anther locules or with an appendage; gynoecium mostly inferior, sometimes essentially superior, 1-many-locular, the style simple, the stigma usually capitate or punctate; ovules anatropous, axile or basal or on a free central placenta or rarely parietal, (1-) 2-many per locule; fruit loculicidally capsular or baccate, the seeds 1-many, often minute, without endosperm, the embryo often straight.

DISTRIBUTION: Primarily pantropical and subtropical, with about 250 genera and probably more than 4,000 species. The Melastomataceae include some of the most striking ornamental plants of the tropics, and many species are in cultivation. A few species readily become naturalized and some are weeds. Seven genera are known to occur in Fiji, four of them with indigenous species, two only in cultivation, and one represented by a pernicious weed.

USEFUL TREATMENTS OF FAMILY: COGNIAUX, A. Melastomaceae. DC. Monogr. Phan. 7: 1-1256. 1891. KRASSER, F. Melastomataceae. Engl. & Prantl, Nat. Pflanzenfam. III. 7: 130-199. 1893; BAKHUIZEN VAN DEN BRINK, R. C., JR. A contribution to the knowledge of the Melastomataceae occurring in the Malay Archipelago especially in the Netherlands East Indies. Meded. Bot. Mus. Herb. Rijks Univ. Utrecht 91: 1-391. 1943 (repr. Rec. Trav. Bot. Néerl. 40: 1-391. 1945); BACKER, C. A., & R. C. BAKHUIZEN VAN DEN BRINK, JR. Melastomataceae. Fl. Java 1: 354-374. 1963. VLIET, G. J. C. M. VAN. Wood anatomy of the palaeotropical Melastomataceae. Blumea 27: 395-462. 1981. VLIET, G. J. C. M. VAN, J. KOEK-NOORMAN, & B. J. H. TER WELLE. Wood anatomy, classification and phylogeny of the Melastomataceae. Blumea 27: 463-473. 1981.

KEY TO GENERA

- Seeds numerous, small; ovary with 2 or more locules, the ovules borne on axillary or basal placentae; leaf blades with 3, 5, or 7 (or more) nerves arising from base or near to it, the cross-venation obvious.
- Ovules and seeds inserted on inconspicuous placentae at inner angles of locules; anthers dehiscent by a single terminal pore.
- Fruit capsular, the seeds cochleate; stamens alternately unequal in size.
- Ovary free or proximally attached to hypanthium by inconspicuous septa; our species a cultivated ornamental shrub with pink petals 3-6 cm. long; connective of larger anthers shortly produced.
1. *Tibouchina*
- Ovary attached to hypanthium by obvious longitudinal septa; connective of larger anthers obviously produced.
- Fruit a true capsule, dehiscent at apex with 5 (or 4) valves; our species a cultivated herb with pink to purple petals 2. *Dissotis*
- Fruit dehiscent transversely in an irregular manner, the pericarp subcarinate, the hypanthium thick-walled; our species a frequent, indigenous, low shrub with white to pink petals.
3. *Melastoma*
- Fruit a berry, the seeds not cochleate; stamens essentially equal in size.
- Connective of anthers inconspicuously produced, dorsally thickened; seeds ovoid; our species a naturalized weedy undershrub with hispid, bullate leaf blades. 4. *Clidemia*

- Connective of anthers inconspicuously 2- or 3-lobulate at base; seeds semiovoid to semiobovoid; our species indigenous lianas or scandent shrubs, sometimes epiphytic, often with conspicuous inflorescences. 5. *Medinilla*
- Ovules and seeds inserted on conspicuous clavate placentae, these erect from inner basal angles of locules; fruit a berry with numerous obovoid to oblong-clavate seeds, the persistent vascular skeleton and erect placentae conspicuous; calyx limb closed in bud, usually rupturing irregularly; stamens essentially equal in size, the anthers oblong, dehiscent by lateral clefts, the connective with an obvious basal spur; indigenous trees or shrubs. 6. *Astronidium*
- Seeds 1 or 2, large, the fruit a subglobose berry; ovary unilocular, the ovules 2-12 or more, borne on a free central placenta; stamens equal, the anthers short, dolabriform, dehiscent by lateral clefts, the connective not produced at base; leaf blades with an obvious costa and 2 obscure marginal nerves, the cross-venation obscure; indigenous trees or shrubs. 7. *Memecylon*

1. *TIBOUCHINA* Aubl. Hist. Pl. Guiane Fr. 445. 1775; Cogn. in DC. Monogr. Phan. 7: 197. 1891.

Primarily shrubby plants, with entire, 3-7-nerved leaf blades; inflorescences often in small terminal panicles with involucrate bracts, or axillary and 1-few-flowered; flowers usually 5-merous, the hypanthium often copiously strigose, the calyx lobes conspicuous; petals obovate, conspicuous; stamens usually 10, in our species alternately unequal, the anthers linear-subulate, with a single terminal pore, the connective proximally produced into a bilobed appendage; gynoecium free or proximally attached to hypanthium by inconspicuous septa, the ovary in our species 5-locular, the ovules numerous, axillary, the style curved, distally swollen; fruit a loculicidal capsule, the seeds numerous, cochleate.

TYPE SPECIES: *Tibouchina aspera* Aubl.

DISTRIBUTION: Tropical America, probably with about 300 species, several of which are cultivated elsewhere. One cultivated species is found in Fiji.

1. *Tibouchina semidecandra* (Schrank & Mart. ex DC.) Cogn. in Mart. Fl. Bras. 14(3): 309. 1885, in DC. Monogr. Phan. 7: 205. 1891; J. W. Parham, Pl. Fiji Isl. ed. 2. 213. 1972.

Lasiandra semidecandra Schrank & Mart. ex DC. Prodr. 3: 129. 1828.

As seen in Fiji, *Tibouchina semidecandra* is a sparingly cultivated shrub 2-4 m. high, occurring near sea level, with showy pink petals. Flowers have been noted in November.

TYPE SPECIES: The type, presumably collected by Martius (M HOLOTYPE), came from Minas Gerais, Brazil.

DISTRIBUTION: Indigenous in Brazil, this species is probably more frequently cultivated in Fiji than the single available collection would suggest. It is not the same species as the *Tibouchina* widely established in Hawaii, which is better referred to *T. urvilleana* (DC.) Cogn.

USE: An attractive ornamental.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRE: Cocoa Station, Nanduruloulou, DA 12246.

2. *DISSOTIS* Benth. in Hook. Niger Fl. 346. 1849; Cogn. in DC. Monogr. Phan. 7: 362. 1891; Bakh. f. in Meded. Bot. Mus. Herb. Rijks Univ. Utrecht 91: 53. 1943. Nom. cons.

Prostrate or ascending herbs, sometimes shrubby, with small, entire, 3- or 5-nerved leaf blades; flowers solitary and pseudoaxillary or few and paniculate or capitate, 4- or 5-merous (as in our species), the hypanthium campanulate, pubescent (in our species with copious, long-stalked, stellate hairs), the calyx lobes lanceolate; petals obovate, conspicuous; stamens (8 or) 10, alternately unequal, the anthers linear, with a single terminal pore, the connective of the larger anthers conspicuously produced; gynoecium

cium attached to hypanthium by longitudinal septa, the ovary (4- or) 5-locular, the ovules numerous, axillary, the style filiform; fruit an apically 5-valved capsule, the seeds numerous, cochleate.

TYPE SPECIES: *Dissotis grandiflora* (Sm.) Benth. (*Osbeckia grandiflora* Sm.), the only original species.

DISTRIBUTION: An African genus with about 150 species, several of which are cultivated or occasionally naturalized elsewhere. A single species is cultivated in Fiji.

1. *Dissotis rotundifolia* (Sm.) Triana in Trans. Linn. Soc. 28: 58. 1871; Cogn. in DC. Monogr. Phan. 7: 369. 1891; Backer & Bakh. f. Fl. Java 1: 360. 1961; J. W. Parham, Pl. Fiji Isl. ed. 2. 210. 1972.

Osbeckia rotundifolia Sm. in Rees, Cycl. 25. 1813.

Melastoma plumosa D. Don in Mem. Wern. Nat. Hist. Soc. 4: 291. 1823.

Dissotis plumosa Benth. in Oliver, Fl. Trop. Afr. 2: 452. 1871; Bakh. f. in Meded. Bot. Mus. Herb. Rijks Univ. Utrecht 91: 55. 1943.

An attractive herb, with creeping and ascending branches, cultivated near sea level in Fiji. The hypanthium has conspicuous and apically stellate-branched bristles; the petals are rich pink to purple, the filaments greenish yellow, the outer anthers dull purple, and the inner anthers bright yellow. Flowers and fruits are found at any season.

TYPIFICATION AND NOMENCLATURE: Both basionyms are typified by plants from Sierra Leone, Africa; the holotype of *Osbeckia rotundifolia* is not referred to a collector but is probably in the J. E. Smith Herbarium; that of *Melastoma plumosa*, collected by Afzelius, is said to be in the Lambert Herbarium, now unfortunately dispersed.

DISTRIBUTION: Indigenous in tropical Africa, now widely cultivated and sometimes naturalized. In Fiji it is known only in cultivation but is doubtless more frequent than implied by the cited collections, being abundant in Suva gardens. In Samoa *Dissotis rotundifolia* is sparingly naturalized along trails, at least on Upolu.

USE: An attractive ground- and wall-cover as an ornamental.

AVAILABLE COLLECTIONS: MAMANUTHAS: YANUTHA: J. M. Fogg (kodachrome only). VITI LEVU: REWA: Suva, Edinburgh Drive, DA 12603; Suva, in private gardens, DA 16213, 16728.

3. MELASTOMA L. Sp. Pl. 389. 1753; Seem. Fl. Vit. 89. 1866; Cogn. in DC. Monogr. Phan. 7: 343. 1891; Bakh. f. in Meded. Bot. Mus. Herb. Rijks Univ. Utrecht 91: 55. 1943.

Erect shrubs or small trees, usually with strigose-pilose branchlets, the leaf blades entire, 3-7-nerved, with conspicuous cross-veins; inflorescences terminal or distally axillary, the flowers solitary or often compactly cymose, 5(-7)-merous; hypanthium campanulate, in our species copiously strigose with scalelike hairs and with ovate lobes, these at length caducous; petals obovate; stamens 10 (-14), alternately unequal, the anthers oblong-linear, with a single terminal pore, the connective of larger anthers produced and bilobed; gynoecium attached to hypanthium by longitudinal septa, the ovary usually 5-locular, the ovules numerous, axillary, the style filiform, curved; fruit with a subcarnose pericarp, irregularly transversely dehiscent, the seeds numerous, cochleate.

LECTOTYPE SPECIES: *Melastoma malabathricum* L. (*M. "malabathrica"*) (vide Hitchcock & Green, Prop. Brit. Bot. 153. 1929), one of Linnaeus's seven original species. This species is also the basis of *Malabathris* Raf. Sylva Tellur. 97. 1838.

DISTRIBUTION: Southeastern Asia and the Seychelles through Malesia into Australia and Polynesia; there may be nearly 100 species, one of which is widespread in the Pacific.

1. *Melastoma denticulatum* Labill. Sert. Austro-Caled. 65. pl. 64, as *M. denticulata*. 1825; DC. Prodr. 3: 144. 1828; Hook. in Bot. Mag. 82: t. 4957. 1856; Seem. Fl. Vit. 89. 1866; Triana in Trans. Linn. Soc. 28: 59. 1871; Drake, Ill. Fl. Ins. Mar. Pac. 171. 1890; Cogn. in DC. Monogr. Phan. 7: 356. 1891; Krasser in Engl. & Prantl, Nat. Pflanzenfam. III. 7: 153. fig. 70, C, D. 1898; Gibbs in J. Linn. Soc. Bot. 39: 147. 1909; Turrill in op. cit. 43: 22. 1915; Guillaumin in J. Arnold Arb. 12: 259. 1931; Christophersen in Bishop Mus. Bull. 154: 29. 1938; Yuncker in op. cit. 184: 55. 1945, in op. cit. 220: 205. 1959; St. John & A. C. Sm. in Pacific Sci. 25: 336. 1971; J. W. Parham, Pl. Fiji Isl. ed. 2. 213. 1972.

Melastoma malabathricum sensu Forst. f. Fl. Ins. Austr. Prodr. 33, as *M. malabathrica*. 1786; J. W. Parham in Dept. Agr. Fiji Bull. 35: 60. 1959, Pl. Fiji Isl. 148. 1964; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 36, 67, 83, 96, 111, 125. 1972; non L.

Melastoma taitense DC. Prodr. 3: 144. 1828; Guillemin in Ann. Sci. Nat. Bot. II. 7: 354. 1837 (repr. Zephyr. Tait. 60. 1838); Naudin in Ann. Sci. Nat. Bot. III. 13: 275. 1850; A. Gray, Bot. U. S. Expl. Exped. 1: 601. 1854; Seem. Fl. Vit. 90. 1866.

Melastoma vitiense Naudin in Ann. Sci. Nat. Bot. III. 13: 275. 1850; A. Gray, Bot. U. S. Expl. Exped. 1: 601. 1854; Seem. in Bonplandia 9: 256. 1861, Viti, 436. 1862.

Melastoma polyanthum sensu A. Gray, Bot. U. S. Expl. Exped. 1: 602. 1854; Seem. in Bonplandia 9: 256. 1861, Viti, 436. 1862; non Bl.

Melastoma novae-hollandiae sensu Seem. Fl. Vit. 90. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 172. 1890; non Naudin.

In Fiji *Melastoma denticulatum* occurs at elevations from near sea level to 1,130 m., usually in sunny places on hillsides among reeds and ferns, but also in clearings, thickets, and forest. It is found as a shrub 0.5-4 m. high or sometimes as a freely branching tree to 7 m. high. Its pedicels and hypanthium are pinkish or dull pink, the calyx lobes green-tipped; the petals are white and often pink-tinged, sometimes pale pink; the filaments are white to pale green, the anthers yellow or greenish yellow, sometimes dorsally or distally pinkish; the style is greenish white to pale green; and the fruit is purple to red-purple at maturity. Flowers and fruits occur throughout the year.

TYPIFICATION AND NOMENCLATURE: References to the abundant *Melastoma* of the southern Pacific have often been nomenclaturally erroneous; the species occurring from Fiji eastward cannot be referred to either *M. malabathricum* L., *M. polyanthum* Bl., or *M. novae-hollandiae* Naudin. The first of these has substantially larger flowers than the Pacific species, especially with reference to its calyx lobes and petals, the latter being deep pink to purple; it probably does not occur east of New Guinea and Australia. *Melastoma polyanthum* (discussed at length by Bakhuizen in Meded. Bot. Mus. Herb. Rijks Univ. Utrecht 91: 64 seq. 1943, but later, in Backer & Bakh. f. Fl. Java 1: 358. 1963, referred to *M. affine* D. Don) also has larger flowers than the Pacific plant and usually red-purple petals, although it is quite distinct from *M. malabathricum*; its eastern limit appears to be New Guinea and the Bismarck Archipelago. Triana, in Trans. Linn. Soc. 28: 59. 1871, seems correctly to have reduced *M. novae-hollandiae* to *M. malabathricum*.

The common *Melastoma* of the southern Pacific is characterized by having fairly small leaves, a stiff and harsh indument, and comparatively small flowers with white (to pinkish) petals. Examination of extensive material from New Caledonia, the New Hebrides, and archipelagoes eastward to the Societies convinces me that Triana (1871, cited above) was correct in referring *M. taitense* DC. and *M. vitiense* Naudin to the synonymy of *M. denticulatum* Labill. The holotype of *M. denticulatum*, collected by Labillardière in New Caledonia, is probably at FI. The holotype of *M. taitense* was cited by de Candolle merely as "v. s. in h. Gaudichaud et Merat," but Naudin (1850,

cited above) implied that it is a *Vesco* specimen collected in Tahiti at 300–600 m.; it is doubtless deposited at *P. Melastoma vitiense* is typified by *Le Guillou* (*P* HOLOTYPE), collected on Ovalau in October, 1838.

DISTRIBUTION: Solomon Islands, New Hebrides, and New Caledonia eastward to the Societies (cf. van Balgooy in *Blumea* Suppl. 5: 222. 1966). *Melastoma denticulatum* is an aggressive plant throughout its range, often behaving like a weed in its degree of dominance in certain open habitats. However, it appears to be indigenous, with a degree of vagility and adaptability that has permitted its vigorous encroachment into the southern Pacific. I doubt if any other species of *Melastoma* occurs from the New Hebrides to the Societies, but I have seen no material from west of the Solomons that can be referred to it. A close relative in Malesia is not obvious. In Fiji it is one of the most abundant flowering plants, more than 100 collections being available.

LOCAL NAMES AND USES: The most common names in use for this well-known plant are *kaurisinga*, *kaurasinga*, and *kaurisinga*, but also recorded are *ndothendothe*, *ndoloriloto*, *ndorondorokiloto*, *ndorondorokilotu*, *nderinderikilotu*, *singasinga*, *singandrandra*, *ndenindenisinga*, and *severo ni Viti*. On Viti Levu the chewed leaves are used to apply to wounds, and leaves are boiled in salt water to prepare a mouth rinse for toothache.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Eastern base of Mt. Evans Range, *Smith* 4268; Nandarivatu, *Gibbs* 593; Navai, *im Thurn* 199. NANDRONGA & NAVOSA: Northern portion of Rairaimatuku Plateau, *Smith* 5439. SERUA: Mt. Nggamu, vicinity of Ngaloa, *Degener* 15065. NAMOSI: Mt. Voma, *Gillespie* 2737; Nakavu, on Navua River, *Parks* 20377. NAITASIRE: Tholo-i-suva, *DA* 9278 (*McKee* 2847). TAILEVU: Namara, *Seemann* 180. REWA: Lami, *Krauss* 441. KANDAVU: Naikorokoro, *DA* 13858 (*DF* 276, *Damanu* 4). OVALAU: *U. S. Expl. Exped.*; Port Kinnaird, *Seemann* 179. NGAU: *Milne* 125. VANUA LEVU: MBUA: Lower Wainunu River Valley, *Smith* 1748. MATHUATA: Tambia, *DA* 8760. THAKAUNDOVE: Savusavu Bay region, *Degener* & *Ordenez* 13833. TAVEUNI: Waiyevo, *Gillespie* 4807. MOALA: Ndelaimoala, *Smith* 1358. MATUKU: *Moseley* s. n. TOTOKA: *Milne* 83, p. p. VANUA MBALAVU: *Graeffe* s. n. LAKEMBA: *Harvey* s. n. FIJI without further locality, *U. S. Expl. Exped.*

4. *CLIDEMIA* D. Don in Mem. Wern. Nat. Hist. Soc. 4: 284, 306. 1823; Cogn. in DC. Monogr. Phan. 7: 984. 1891; Bakh. f. in Meded. Bot. Mus. Herb. Rijks Univ. Utrecht 91: 113. 1943.

Branching shrubs, often with copiously pilose branchlets, the leaf blades subequal, (3–) 5(–7)-nerved, with distinct cross-veins, in our species crenate, bullate, hispid on both surfaces; flowers in compact, axillary or subterminal panicles, usually 5-merous; hypanthium campanulate, usually pilose (in our species copiously hispid, the lobes short but each with a conspicuous filiform appendage, this at length caducous); petals obovate; stamens usually 10 (as in our species), essentially equal, the anthers linear, with a single terminal pore, dorsally thickened, the connective inconspicuously produced proximally; ovary concrescent with hypanthium, usually 5-locular, the ovules numerous, axillary, the style filiform; fruit a subglobose, carnos berry, the seeds numerous, ovoid.

LECTOTYPE SPECIES: Not yet designated (ING, 1979).

DISTRIBUTION: Tropical America, probably with more than 150 species; at least one species is widely naturalized elsewhere.

1. *Clidemia hirta* (L.) D. Don in Mem. Wern. Nat. Hist. Soc. 4: 309. 1823, in DC. Prodr. 3: 157. 1828; Cogn. in DC. Monogr. Phan. 7: 986. 1891; Simmonds in Agr. J. Dept. Agr. Fiji 7: 3. 1934; Paine in op. cit. 7: 10. 1934; A. C. Sm. in *Sargentia* 1: 87. 1942; Bakh. f. in Meded. Bot. Mus. Herb. Rijks Univ. Utrecht 91: 113. 1943; Greenwood in Proc. Linn. Soc. 154: 98. 1943, in J. Arnold Arb. 36: 398. 1955;

Mune & Parham in Dept. Agr. Fiji Bull. 31: 22. fig. 4. 1957; J. W. Parham in op. cit. 35: 60. fig. 23. 1959. Pl. Fiji Isl. 147. 1964, ed. 2. 210. 1972; Mune & Parham in Dept. Agr. Fiji Bull. 48: 38. fig. 10. 1967.

Melastoma hirta L. Sp. Pl. 390. 1753.

In Fiji this weedy shrub may be found from near sea level to 1,323 m. (the highest elevation), abundantly naturalized in open or dry forest, on the edges of forest, and in secondary forest. It occurs as a shrub 0.5–3 m. high, forming dense thickets, with white to pink petals, and with the fruit blue to deep purple at maturity. Flowers and fruits are not seasonal.

TYPEIFICATION: The type locality is doubtless the West Indies, Linnaeus citing references to Plumier and Plukenet.

DISTRIBUTION: Mexico and the West Indies southward to central Brazil; although it is locally frequent in native vegetation it does not seem to be an aggressive weed in the Western Hemisphere. Unfortunately it has become such a weed in the Pacific, notably in Fiji and Hawaii. In Fiji, however, a degree of control has been brought about by the introduction of a species of thrips (*Liothrips urichi*), and the plant is considerably less troublesome now than it was some 50 years ago. It is a declared noxious weed; notes on biological control are detailed by Parham and by Mune and Parham in the 1959 and 1967 references listed above. *Clidemia hirta* has probably been in Fiji since the late nineteenth century (cf. Greenwood, 1943, cited above), although the first Fijian herbarium record may be DA (κ), sent for identification by the Superintendent of Agriculture on July 17, 1905. The approximately 50 available collections of the plant obviously do not give a true picture of its local abundance.

LOCAL NAMES: The earlier collectors in Fiji did not obtain this plant, which may have been unwisely introduced as an ornamental; it is a local assumption that the unwelcome introduction be accredited to an unfortunate gentleman (whose name seems more vague than his contribution) and forever known as *Koster's* (*Koester's*, *Küster's*) *curse*. Other recorded local names are *kauresinga*, *kaurasinga*, *roinisinga*, *ndraunisinga*, *mbona na mbulamakau*, and *vuti*.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Yalombi, *St. John* 18023. VITI LEVU: MBA: Mountains near Lautoka, *Greenwood* 1210; Nandarivatu, *Degener* 14266; summit of Mt. Tomanivi, *DA* 7088. NANDRONGA & NAVOSA: Nausori Highlands, *DA* 12675 (*Melville et al.* 7051). SERUA: Ndeumba, *DA* 9178 (*McKee* 2742). RA: Lau, *DA* 10953. NAITASIRE: Tamavua, *Gillespie* 2015. TAILEVU: Ndakuivuna, *DA* 11026. REWA: Suva Bay, *Bryan* 187. KANDAVU: Hills above Namalata and Ngaloa Bays, *Smith* 119. VANUA LEVU: MBUA: Southern portion of Seatovo Range, *Smith* 1703. MATHUATA: Wainikoro District, *Greenwood* 211A. THAKAUNDROVE: Savusavu, *Bierhorst* F38. TAVEUNI: Waiyevo, *Gillespie* 4786.4. VANUA MBALAVU: Near Lomaloma, *Garnock-Jones* 1097. MANGO: *DA* 5832. LAKEMBA: Tumbou River forks, *Garnock-Jones* 837.

5. *MEDINILLA* Gaud. Voy. Uranie et Physicienne, Freycinet, Bot. 484. 1830; Seem. Fl. Vit. 88. 1866; Cogn. in DC. Monogr. Phan. 7: 572. 1891; A. C. Sm. in Sargentia 1: 79. 1942; Bakh. f. in Meded. Bot. Mus. Herb. Rijks Univ. Utrecht 91: 147. 1943.

Aplectrum A. Gray, Bot. U. S. Expl. Exped. 1: 597, solum quoad spec. vit. 1854; sensu Seem. Fl. Vit. 87. 1866; non sensu nom. nov.: *Aplectrum* Bl. (1831), non Torrey (1826).

Lianas or scandent shrubs, sometimes epiphytic, or perhaps small trees (but none of our species), the leaves of a pair equal to sharply unequal, the blades entire, 3–9-nerved; inflorescences terminal or axillary or cauline, usually paniculate or cymose or racemiform, often with conspicuous bracts and bracteoles, the flowers in our species usually 4-merous; hypanthium campanulate or ovoid, the limb truncate or short-lobed; petals ovate to obovate, sometimes oblique; stamens usually 8 and essentially equal in our species, the anthers linear or subdeltoid, with a single terminal

pore, inconspicuously 2- or 3-lobulate at base; ovary inferior, usually 4-locular in our species, the ovules numerous, axillary, the style filiform; fruit a subglobose berry, the calyx limb persistent, the seeds numerous, semiovoid to semiobovoid.

TYPE SPECIES: *Medinilla rosea* Gaud. As discussed by Airy Shaw (in Kew Bull. 14: 459-460. 1960), Gray (1854) published *Anplectrum* as a substitute name for *Aplectrum* Bl. (1831), a later homonym of *Aplectrum* Torrey (1826). However, the Fijian species which Gray described belongs in *Medinilla* (*M. ovalifolia*, q. v.).

DISTRIBUTION: Africa and Madagascar to southern Asia and Malesia and eastward to Fiji and Samoa; there are more than 400 described species. In Fiji I here recognize eleven species, presumably all endemic. In 1942 I mentioned *M. heterophylla* and *M. rhodochlaena* as probably extending to Samoa, but current study inclines me to doubt such identifications; the Samoan species require careful reexamination.

USEFUL TREATMENT OF GENUS: SMITH, A. C. *Medinilla* Gaud. *Sargentia* 1: 79-86. 1942.

Medinilla includes some of the most attractive plants indigenous in Fiji, and the species appear very distinct from one another. Useful differentiating characters are found in the indument and foliage, the type and position of the inflorescences, the size and shape of the bracts (at inflorescence nodes) and bracteoles (subtending the calyx), and the size of the flowers (especially as to petals, anthers, and style). In this genus color of inflorescence parts is striking and quite dependable, particularly as to the bracts, bracteoles, petals, and anthers.

KEY TO SPECIES

- Floral bracteoles large, 12-35 mm. long; flowers large, the petals 13-26 mm. long, 8-25 mm. broad, the anthers 4.5-8 mm. long, the style 10-22 mm. long; leaf blades attenuate to obtuse at base, the leaves isomorphic or dimorphic.
- Young branchlets and inflorescence parts brown-furfuraceous or -farinose; pedicels articulate 5-8 mm. below calyx, the bracteoles elliptic, 12-20 mm. long, 5-10 (-18) mm. broad, stipitate at base, soon caducous; bracts and bracteoles brown when dried; leaves isomorphic. 1. *M. longicymosa*
- Young branchlets and inflorescence parts glabrous or sparsely furfuraceous-puberulent; pedicels articulate less than 4 mm. below calyx, the bracteoles ovate or elliptic-suborbicular, 18-35 mm. long, 13-30 mm. broad, obtuse to subcordate at base, sessile, closely enveloping flower, persistent; inflorescence branches, bracts, and bracteoles persistently bright red to pink.
- Leaves of mature plant isomorphic; leaf blades 4-8 × 2.5-4 cm., attenuate to acute at base, 3- or 5-nerved; inflorescence branches, bracts, bracteoles, and pedicels brilliant red or scarlet; pedicels 15-25 mm. long at anthesis; flower-subtending bracteoles strictly opposed, ovate, 23-35 × 15-30 mm., rounded or subcordate at base; flowers comparatively large, the petals white, 23-26 × 20-25 mm.; filaments broadly ligulate, 1.2-1.5 mm. broad, 8-10 mm. long; anthers 7-8 mm. long, with only the posterior basal lobe obvious; style 20-22 mm. long. 2. *M. waterhousei*
- Leaves of mature plant isomorphic or dimorphic; leaf blades of larger leaves 6-12 × 3.5-6.5 cm., obtuse at base, usually 7-nerved; inflorescence branches, bracts, bracteoles, and pedicels magenta or pink; pedicels 5-10 mm. long at anthesis; flower-subtending bracteoles obviously imbricate, elliptic-orbicular, 18-22 × 13-15 mm., obtuse at base; flowers smaller, the petals pale pink, 17-20 × 14-17 mm.; filaments about 0.5 mm. broad, 6-7 mm. long; anthers 4.5-5 mm. long, obviously 3-lobulate at base; style 10-12 mm. long. 3. *M. spectabilis*
- Floral bracteoles smaller, less than 12 mm. long (except in no. 9, with bracteoles up to 20 × 15 mm.); flowers smaller, the petals 6-13 mm. long, 5-11 mm. broad, or less, the anthers less than 5 mm. long, the style less than 13 mm. long; leaves often dimorphic.
- Bracts and bracteoles similar or dissimilar, the bracteoles elliptic or obovate to reniform, 4-15 mm. broad, often clasping and concealing hypanthium, persistent and conspicuous.
- Blades of larger leaves subcordate or rounded at base, rarely obtuse; dimorphism of leaves usually pronounced; bracts (at least those of distal nodes) 4-14 mm. broad, essentially similar to bracteoles.
- Inflorescences amply paniculate, with long, racemiform branches, often on stems (if associated with leaves often compactly cymose and not conspicuously divaricate); bracts usually 3 or 4 at nodes, rarely only 2, obovate, longer than broad, white; bracteoles white; anthers trilobulate at base, the posterior lobe obvious. 4. *M. heterophylla*

Inflorescences divaricate-cymose; bracts paired at nodes and reniform or suborbicular (at least on distal portions of inflorescences), usually broader than long, pink; bracteoles pink; anthers bilobulate at base, the posterior lobe lacking. 5. *M. archboldiana*

Blades of larger leaves rounded to attenuate at base (rarely subcordate in no. 9); bracts (even those of distal nodes) less than 3 mm. broad, conspicuously smaller than bracteoles.

Flowers large, the petals 12–13 mm. long, 10–11 mm. broad, the anthers 4–5 mm. long, the posterior basal lobe larger than the 2 anterior lobes, the style 12–13 mm. long; bracteoles longer than broad; leaf blades conspicuously attenuate at base, the nerves oriented from base.

6. *M. kandavuensis*

Flowers smaller, the petals 7–8.5 mm. long, 5–7 mm. broad, the anthers 1.7–2.5 mm. long, the style 5–7 mm. long; leaf blades with the upper nerves often joined for the basal 5–30 mm.

Bracteoles comparatively small, 4–11 mm. long and broad, puberulent but eventually subglabrate; anthers with the 2 anterior lobes more conspicuous than the posterior lobe; younger parts puberulent to furfuraceous with hairs 0.1–0.4 (–0.8) mm. long, soon subglabrate.

Leaves usually isomorphic, the longer petioles 1–4 cm. long, the blades attenuate at base; bracts green, 0.6–1.5 mm. broad, the bracteoles dull pink, 4–7 mm. broad, elliptic.

7. *M. decora*

Leaves usually strongly dimorphic, infrequently isomorphic, the longer petioles 0.5–2 cm. long, the blades acute to rounded at base; bracts and bracteoles rich pink to purple-red, the bracts 1–3 mm. broad, the bracteoles 5–11 mm. broad, orbicular or reniform.

8. *M. rhodochlaena*

Bracteoles comparatively large, 12–20 × 9–15 mm., soft-pilose on both sides with hairs 0.3–0.7 mm. long, the bracts and bracteoles pale green or greenish white or faintly pink-tinged; anthers with the 2 anterior lobes less conspicuous than the posterior lobe; leaves strongly dimorphic, the petioles of the larger leaves 0.2–1.5 cm. long; younger parts copiously tomentose with multicellular, laterally short-calcarate hairs 1–2 mm. long. 9. *M. subviridis*

Bracts and bracteoles more or less similar, obovate- or elliptic-oblong or oblong-ligulate, small, 3 mm. broad or less, the bracteoles inconspicuous, not concealing hypanthium.

Leaves often dimorphic, the larger blades 5- or 7-nerved, 7–15 cm. long, 4.5–10 cm. broad, subcordate to broadly obtuse at base, rarely subacute. 10. *M. kambikambi*

Leaves essentially isomorphic, the blades 3- or 5-nerved, 2.5–9 cm. long, 1.5–5.5 cm. broad, attenuate to acute at base, rarely obtuse or nearly rounded. 11. *M. ovalifolia*

1. *Medinilla longicymosa* Gibbs in J. Linn. Soc. Bot. 39: 147. pl. 14. 1909; Turrill in op. cit. 43: 22. 1915; A. C. Sm. in Sargentia 1: 80. 1942; J. W. Parham, Pl. Fiji Isl. 148. 1964, ed. 2. 211. fig. 62. 1972. FIGURES 71A, 92 (lower).

A high-climbing liana, appearing at higher elevations to be a compact epiphytic shrub or rarely a small terrestrial shrub, occurring at elevations of 250–1,323 m. (rarely at the lower limit, becoming frequent upward to the highest elevation of Viti Levu). It is found in dense forest and especially in the mossy forest of high ridges. Its inflorescence branches, pedicels, and hypanthium are rich or deep pink to dull pink, with brown indument; its bracts and bracteoles are pale to rich pink, its petals white, its filaments white to pale yellow, its anthers often bright yellow and with a dull purple spur, and its style is white to yellowish. Flowers have been obtained between May and November.

TYPEFICTION: The type is *Gibbs 884* (BM HOLOTYPE), collected in 1907 on a wooded ridge above Nandarivatu, Mba Province, Viti Levu. Gibbs also cited her 547 as being probably a different species, but at BM it is mounted together with the holotype and is certainly correctly so placed.

DISTRIBUTION: Endemic to Fiji and thus far known only from Viti Levu, from which some 30 collections are now available.

LOCAL NAMES: *Wa kula* and *wa vatu* are recorded from central Viti Levu.

REPRESENTATIVE COLLECTIONS: VITI LEVU: Mba: Summit of Mt. Koroyanitu, high point of Mt. Evans Range, *Smith 4171*; vicinity of Nandarivatu, *im Thurn 284*; summit of Mt. Nanggaranambuluta, *Gillespie 3777*; summit of Mt. Tomanivi, *Smith 5185*. NANDRONGA & NAVOSA: Ridge between Koronayalewa and Vonolevu, *DA 1418 (DF 141)*. NANDRONGA & NAVOSA-NAMOSI boundary area: Ridge between Singatoka and Navua Rivers, *DA 2469*. SERUA: Mt. Tikituru, *DA 14472*. NAMOSE: Summit of Mt. Naitarandamu, *Gillespie 5102*; valley of Wainambua Creek, south of Mt. Naitarandamu, *Smith 8826*; Korombasambasanga Range, *DA 2161*. NAITASIRI: Rairaimatuku Plateau, between Mt. Tomanivi and Nasonggo, *Smith 5798*; Tholo-i-suva, *DA 10259*. REWA: Veisari River area, *Horne 1039*.

2. *Medinilla waterhousei* Seem. Fl. Vit. 89. 1866; Triana in Trans. Linn. Soc. 28: 87. 1871; Drake, Ill. Fl. Ins. Mar. Pac. 172. 1890; Cogn. in DC. Monogr. Phan. 7: 590. 1891; A. C. Sm. in Bishop Mus. Bull. 141: 111. 1936; Paine in Agr. J. Dept. Agr. Fiji 11: 56. 1940; A. C. Sm. in Sargentia 1: 80. 1942; J. W. Parham, Pl. Fiji Isl. 148. *frontispiece*. 1964, ed. 2. 211. 1972. FIGURE 93 (upper).

Medinilla rhodochlaena sensu Seem. in Bonplandia 9: 256. 1861; non A. Gray.

Medinilla sp. Seem. Viti, 436. 1862.

This beautiful plant occurs at elevations of 660–1,241 m. in dense forest and crest thickets, as a high-climbing liana with inflorescences either on stems or associated with leaves. Its inflorescence branches, bracts, bracteoles, and pedicels are scarlet or bright red, its hypanthium is white and faintly reddish-tinged, its petals and filaments are white, its anthers rich purple with yellow basal lobes, and its style is white. It appears to be in flower much of the year.

TYPIFICATION: The type is *Seemann 175* (K HOLOTYPE), collected in 1860 on mountains above Somosomo, Taveuni. The plant is named in honor of the Rev. J. Waterhouse, who apparently told Seemann of its occurrence.

DISTRIBUTION: Endemic to Fiji and long believed limited to the higher parts of Taveuni, but my specimens from Mt. Seatura in western Vanua Levu appear indistinguishable. The more easterly high points of Vanua Levu have thus far not disclosed the species. Only twelve collections are known to me; because of the limited range all are cited.

LOCAL NAMES: *Tangimauthia* (Taveuni); *tekiteki vuina motheawa* (Mbuu).

AVAILABLE COLLECTIONS: VANUA LEVU: MBUU: Navotuvotu, summit of Mt. Seatura, *Smith 1653*. TAVEUNI: Trail above Somosomo, *Gillespie 4781, 4848.5*; crater lake east of Somosomo and surrounding slopes, *Smith 850, 8361, DA 2566, 10932, 14089*; summit of Uluingalau (high point of Taveuni), *Smith 899*; Taveuni without further locality, *DA 1007, 11979*.

Medinilla waterhousei is justifiably considered one of the most striking plants indigenous in Fiji; its limited distribution and its beauty gave it a legendary significance in the archipelago, where its decorative use was a rarely utilized privilege reserved for the chiefly families of Somosomo. To enter the misty crater of Taveuni, to find the startling blooms of the *tangimauthia* in the dark forest, and to hold the brilliant inflorescences, cold and heavy with rain, must remain a high point in the recollections of a few fortunate botanists. To explain the derivation of the name *tangimauthia* (which may be translated "crying in vain"), it is claimed that the child of a local chief saw the plant and cried (*tangi*) for it, but as it could not be transplanted, crying was useless (*maumau*), for there was nothing resembling it (*uthuia*) to put in its place (Paine, 1940, cited above; R. A. Derrick, *The Fiji Islands*, 67. 1951).

3. *Medinilla spectabilis* A. C. Sm. in Contr. U. S. Nat. Herb. 37: 82. 1967; J. W. Parham, Pl. Fiji Isl. ed. 2. 211. 1972. FIGURE 93 (lower).

The second spectacular *Medinilla* of upland Taveuni also occurs upward of 660 m. in dense forest and crest thickets as a high-climbing liana. Its inflorescence branches, bracts, and bracteoles are magenta or pink, its hypanthium is white suffused with pink, its petals are pale pink, its filaments and style white, and its anthers rich blue with yellow basal lobes.

TYPIFICATION: The type is *Smith 8362* (US 2191067 and 2191068 HOLOTYPE; many ISOTYPES), collected Aug. 18, 1953, in hills east of Somosomo, west of the old crater occupied by a small swamp and lake, Taveuni.

DISTRIBUTION: Endemic to Fiji and apparently to Taveuni, where it is known only from one collection other than the type.

AVAILABLE COLLECTION: TAVEUNI: Ridge toward Mt. Uluingalau, alt. 1,220m., *DA 13181* (coll. *D. Koroiveibau*).

It would seem unlikely that a second species of the general relationship of *Medinilla waterhousei* should occur in the same area of Taveuni, but the contrasting characters utilized in my key, especially in reference to color, arrangement and shape of bracteoles (marginally imbricate rather than strictly opposed), and floral dimensions, do not suggest another solution.

4. *Medinilla heterophylla* A. Gray, Bot. U. S. Expl. Exped. **1**: 598. 1854, Atlas, *pl.* 75. 1856; Seem. in *Bonplandia* **9**: 256. 1861, Viti, 436. 1862, Fl. Vit. 88. 1866; Triana in *Trans. Linn. Soc.* **28**: 87. 1871; Drake, *Ill. Fl. Ins. Mar. Pac.* 172. 1890; Cogn. in *DC. Monogr. Phan.* **7**: 598. 1891; Gibbs in *J. Linn. Soc. Bot.* **39**: 147. 1909; A. C. Sm. in *Sargentia* **1**: 81. 1942; J. W. Parham, *Pl. Fiji Isl.* 148. 1964, ed. 2. 211. 1972.

A liana occurring in dense forest, or occasionally on the edges of forest, at elevations of 50–1,120 m. Its inflorescences commonly occur on the stem, often near the ground, but frequently they are also associated with the leaves toward the tops of trees. The inflorescence branches, bracts, bracteoles, and hypanthium are usually pure white, sometimes slightly greenish or faintly pink-tinged; the petals are rich to pale pink, the filaments white or distally yellowish, the anthers yellow with blue to purple basal lobes, the style is white and sometimes pink-tinged, and the fruit is dull purple, at length black. Flowers and fruits occur throughout the year.

TIPIFICATION: The type is *U. S. Expl. Exped.* (US 47890 HOLOTYPE; ISOTYPES at GH, NY), collected in 1840 on Ovalau.

DISTRIBUTION: Endemic to Fiji and now known from six of the high islands. About 75 collections have been examined.

LOCAL NAMES AND USE: Many names are recorded for this frequent and conspicuous species: *wa kula*, *mimilolo*, *wa nduanilulu*, *kambikambi*, *tikoko ni kalou*, *mba-mbalewalu*, *tavolali*, and *wa ni mbai*. In Ra Province the stems are sometimes used for tying house frames.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mt. Evans Range, *Greenwood 1066*; Nandarivatu, *Degener & Ordóñez 13574*; slopes of Mt. Tomanivi, *Smith 5227*. NANDRONGA & NAVOSA: Nambosewale, Nandrau, *DF 1172*. SERUA: Navua area, *Seemann 176*. NAMOSI: Mt. Naitarandamu, *Gillespie 3098*. RA: Vicinity of Rewasa, near Vaileka, *Degener 15372*. NAITASIRE: Vatavula, Wainimala River, *Gibbs 539*; Tholo-i-suva, *Parks 20077*. TAILEVU: East of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7027*. KANDAVU: Mt. Mbuke Levu, *Smith 249*. OVALAU: West of Levuka, *Gillespie 4532*. KORO: Eastern slope of main ridge, *Smith 1013*. VANUA LEVU: MBUA: Upper Ndama River valley, *Smith 1582*. THAKAUNDOVE: Savusavu Bay region, *Degener & Ordóñez 13847*. TAVEUNI: Valley between Mt. Manuka and main ridge of island, east of Wairiki, *Smith 8274*.

5. *Medinilla archboldiana* A. C. Sm. in *Sargentia* **1**: 83. 1942; J. W. Parham, *Pl. Fiji Isl.* 148. 1964, ed. 2. 210. 1972.

An often high-climbing liana, occurring in dense forest and crest thickets at elevations of 100–1,200 m. Its inflorescences usually occur on the stems as well as being associated with the leaves. The inflorescence branches, pedicels, bracts, and bracteoles are rich pink (in contrast to those of *M. heterophylla*); the hypanthium is pink or sometimes white to pale green and pink-tinged, the petals are bright pink, the filaments and style white, the anthers pale purple but proximally yellow, and the fruit is at length purple. Flowers and fruits have been obtained during most months.

TIPIFICATION: The type is *Degener 14366* (A HOLOTYPE), collected Feb. 13, 1941, near Nauwangga, south of Nandarivatu, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from Viti Levu and Ovalau. In the area of northern Viti Levu south of Nandarivatu it appears more abundant than *M. heterophylla*, but the two species are strikingly different in the

coloration and shape of their inflorescences. I have seen about 40 collections.

LOCAL NAMES: *Wa kula, wa ndamu, wa milolo.*



FIGURE 71. A, *Medinilla longicymosa*; flower and subtending bracteole, $\times 2$. B, *Medinilla kandavuensis*; flower with 2 petals removed and subtending bracteoles, and bracts at an inflorescence node, $\times 2$. C & D, *Medinilla decora*; C, distal part of young inflorescence with bracts and bracteoles, $\times 2$; D, 2 flowers and subtending bracteoles, $\times 6$. A from *Smith 8826*, B from *Smith 201*, C & D from *Smith 9398*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, *Gibbs 745*, im *Thurn s. n.*: between Nggaliwana and Tumbeindreketi Creeks, east of Navai, *Smith 5869*; Mt. Tomanivi, *DA 13030*. O. & I. *Degener 32076*. NANDRONGA & NAVOSA: Northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, *Smith 5658*. NANDRONGA & NAVOSA or NAITASIRI: Between Nandrau and Namboubutha Creek, *Horne 944*. NAITASIRI-REWA boundary: Mt. Kombalevu, *Parks 20310*. TAILEVU: Near Copper Mine, Waimaro River, *DA 13635*. OVALAU: Summit of Mt. Tana Lailai and adjacent ridge, *Smith 7715*.

6. *Medinilla kandavuensis* A. C. Sm. in *Sargentia* 1: 83. 1942; J. W. Parham, Pl. Fiji Isl. 148. 1964, ed. 2. 211. 1972. FIGURE 71B.

A forest liana occurring between 200 and 400 m., the inflorescences axillary and also arising from defoliate stems, probably with pink bracts and bracteoles. The petals are pale pink, the filaments and style white, and the anther lobes yellow.

TIPIFICATION: The type is *Smith 201* (GH HOLOTYPE; many ISOTYPES), collected Oct. 18, 1933, in hills above Namalata and Ngaloa Bays, Kandavu.

DISTRIBUTION: Endemic to Fiji and thus far known only from the type collection from Kandavu.

Among those Fijian species with dissimilar bracts and bracteoles, *Medinilla kandavuensis*, in spite of the paucity of material, seems very distinct in its large flowers and in the basally oriented nerves of its leaf blades.

7. *Medinilla decora* A. C. Sm. in *Contr. U. S. Nat. Herb.* 37: 84. 1967; J. W. Parham, Pl. Fiji Isl. ed. 2. 210. 1972. FIGURES 71C & D, 72A.

A high-climbing liana, occurring in dense or dry forest at elevations of 30–600 m. Its inflorescences, usually associated with the leaves, have the bracts and pedicels green or pale green and the bracteoles dull pink; the hypanthium is pale pink, the petals are rich pink, the filaments and style pink-tinged, and the anthers purple, with yellow basal lobes. Flowers have been noted between November and February and young fruits in April.

TIPIFICATION: The type is *Smith 9398* (US 2191868 HOLOTYPE; many ISOTYPES), collected Nov. 30, 1953, in hills between Waininggere and Waisese Creeks, between Ngaloa and Wainiyambia, Serua Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji, and thus far known only from the forested areas of south-central Viti Levu. Since describing the species on the basis of a single collection I have seen seven others, cited below.

LOCAL NAME: *Wa ngairakawa* (DF 351).

AVAILABLE COLLECTIONS: VITI LEVU: SERUA: Inland from Namboutini, *DA 13715*; inland from Ngaloa, *DA 16561*. NAMOSI: Vicinity of Namosi Village, *Anderson 69-78*; Mt. Voma, *DA 11668, 11670*; Lombau River, *DF 351* (*Damanu 40*); Nambukavesi Creek, *DF 232* (*Bola 81*).

8. *Medinilla rhodochlaena* A. Gray, *Bot. U. S. Expl. Exped.* 1: 600. 1854, in *Proc. Amer. Acad. Arts* 5: 317. 1862, in *Bonplandia* 10: 35. 1862; Seem. in op. cit. 10: 296. 1862, Viti, 436. 1862, *Fl. Vit.* 88. 1866; Triana in *Trans. Linn. Soc.* 28: 88. 1871; Drake, *Ill. Fl. Ins. Mar. Pac.* 172, as *M. rodochlaena*. 1890; Cogn. in *DC. Monogr. Phan.* 7: 602. 1891; Gibbs in *J. Linn. Soc. Bot.* 39: 147. 1909; Turrill in op. cit. 43: 22. 1915; A. C. Sm. in *Sargentia* 1: 84. 1942; J. W. Parham, Pl. Fiji Isl. 148. 1964, ed. 2. 211. 1972. FIGURE 72B.

Medinilla Seem. in *Bonplandia* 9: 256. 1861.

A striking liana with axillary inflorescences, occurring at elevations of 30–626 m. in forest and in the dense bush and thickets of crests. Its inflorescence branches, bracts, and bracteoles are rich purplish red or rich pink; the hypanthium is richly pink-tinged, the petals are pink, the filaments and style white, the anthers purple with yellow basal lobes, and the fruit is at length black. Flowers and fruits have been noted at most seasons.

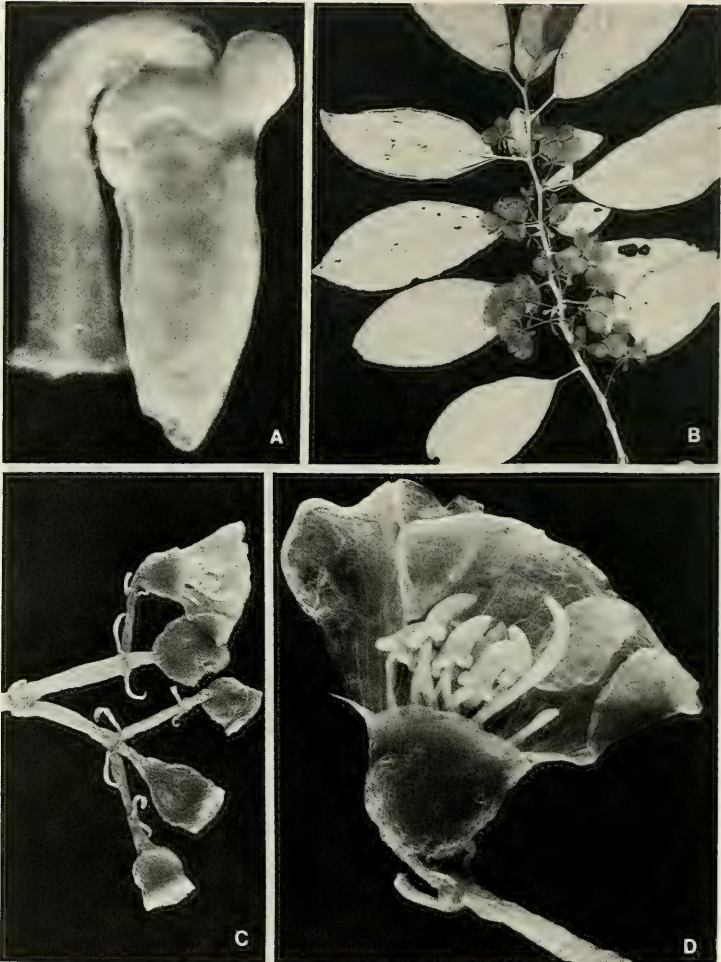


FIGURE 72. A, *Medinilla decora*: stamen, $\times 30$. B, *Medinilla rhodochaena*: distal portion of branchlet, with foliage and inflorescences, $\times 1/3$. C & D, *Medinilla kambikambi*: C, distal part of inflorescence with bracts and bracteoles, the flower with 1 petal removed, $\times 2$; D, flower with 1 petal removed, showing small bracteoles, style, and stamens (1 anther fallen), $\times 6$. A from *Smith 9398*, B from *DA 10990*, C & D from *Smith 1747*.



FIGURE 73. A flowering branchlet of *Medinilla subviridis* in a forested area of Namosi Province, Viti Levu, from Smith 8748, \times about 1/3.

TYPIFICATION: The type is *U. S. Expl. Exped.* (US 47891 HOLOTYPE; ISOTYPE at GH), collected in 1840 in the mountains of Ovalau.

DISTRIBUTION: Endemic to Fiji, and frequent within a limited area comprising the forested parts of southeastern Viti Levu and Ovalau. I have seen about 40 collections. In 1942 I erroneously cited *Gillespie 4277* from Mba Province as this species, but it is now referred to the more recently described *Medinilla subviridis*.

LOCAL NAMES: *Thavathava, resinga, thavathava resinga.*

REPRESENTATIVE COLLECTIONS: VITI LEVU: NAMOSI: Wainandoi River, *DA 12507*; NAITASIRI: Navuso Forest, *DA 69*; Tamavua-Sawani road, *Setchell & Parks 15129*; Tholo-i-suva, *DA 11964*; vicinity of Nasinu, *Gillespie 3600*. TAILEVU: Naingani Island, *DA 3338*. REWA: Naikorokoro Creek, *Meebold 21945*; Veisari River, *DA 10990*; Mt. Korombamba, *Vaughan 3149, DA 16531*. "VITI LEVU and OVALAU:" *Seemann 177*. OVALAU: Summit of Mt. Ndelaiovalau and adjacent ridge, *Smith 7384*; summit of Mt. Tana Lailai and adjacent ridge, *Smith 7705*; Port Kinnaird, *Storck 891*.

9. *Medinilla subviridis* A. C. Sm. in *J. Arnold Arb.* 33: 101. 1952; J. W. Parham, *Pl. Fiji Isl.* 148. 1964, ed. 2. 211. 1972; A. C. Sm. in *Contr. U. S. Nat. Herb.* 37: 82. 1967.

Malpighiacea Seem. in *Bonplandia* 9: 254. 1861.

Medinilla sp. Seem. Viti, 436. 1862.

FIGURE 73.

A high-climbing liana, occurring in dense or dry forest at elevations of 50–970 m. The inflorescences, axillary or arising from defoliate stems, bear pale green or greenish

white bracts and bracteoles, these sometimes faintly pink-tinged and with a copious, persistent, brown indument. The hypanthium is pale green and also pilose; the petals are white and sometimes with a faint pinkish tinge, the filaments and style white, the anthers purple or rich blue with bright yellow basal lobes; and the fruit is at length blue-tinged to deep purple. Flowers and fruits have been obtained between August and January.

TYPIFICATION: The type is *Smith 6112* (A HOLOTYPE; many ISOTYPES), collected Sept. 18, 1947, on the northern portion of the Rairaimatuku Plateau between Mt. Tomanivi and Nasonggo, Naitasiri Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from the forested areas of central and southeastern Viti Levu.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: 2 miles south of Nandarivatu, *Gillespie 4277*. SERUA: Hills between Wainingere and Waisee Creeks, between Ngaloa and Wainiyambia, *Smith 9541*. NAMOSI: Hills north of Wainavindrau Creek, between Korombasambasanga Range and Mt. Naitarandamu, *Smith 8487*; northern slopes of Korombasambasanga Range, in drainage of Wainavindrau Creek, *Smith 8748*; between Namosi Village and Navua River, *Seemann 75*. NAITASIRI: Northern portion of Rairaimatuku Plateau between Mt. Tomanivi and Nasonggo, *Smith 5793*; Nanggarathanghanghi, Mendrausuthu Range, *DA 15030*. TAILEVU: Near Copper Mine, Wainivesi River, *DA 13636*.

This species sharply differs from its congeners in its copious indument and its greenish bracts and bracteoles. It was first collected by Seemann, whose indecision in naming it is reflected in the above synonymy. He finally placed it, with other, correctly named collections, in *Medinilla rhodochlaena* (citing his no. 75 in Fl. Vit. 88. 1866), being overly cautious about describing a striking novelty.

10. *Medinilla kambikambi* A. C. Sm. in *Sargentia* 1: 85. 1942; J. W. Parham, Pl. Fiji Isl. 148. 1964, ed. 2. 211. 1972. FIGURE 72C & D.

A liana, occurring at elevations of 100–650 m. in dense forest or on forest edges or in patches of forest in fairly open areas. The inflorescences, axillary or arising from stems, have branches, bracts, and bracteoles that are deep, rich pink; the hypanthium and petals also are rich pink to deep red, the filaments and style pinkish white to pale pink, the anthers pale yellow and often deeper yellow basally; and the fruit is at length dark purple. Flowers and fruits have been obtained between May and December.

TYPIFICATION: The type is *Smith 1959* (NY HOLOTYPE; many ISOTYPES), collected June 12, 1934, in hills south of Natewa, Natewa Peninsula, Thakaundrove Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from Vanua Levu.

LOCAL NAME: *Kambikambi*.

AVAILABLE COLLECTIONS: VANUA LEVU: MBUA: Lower Wainunu River valley, *Smith 1747*. MATHUATA: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, *Smith 6658*; summit ridge of Mt. Numbuiloa, east of Lambasa, *Smith 6415, 6516*. THAKAUNDRIVE: Mt. Kasi, Yanawai River region, *Smith 1782*; southern slope of Korotini Range, below Navitho Pass, *Smith 503*; Latiki, on trail to Mt. Soro Levu from Savusavu, *DA 17169*; southern slope of Mt. Mariko, *Smith 404*; Vaturova Tikina, *Howard 174*.

This species and the following, readily recognized by their small bracteoles that do not conceal the hypanthium, are separable by well-marked foliage differences.

11. *Medinilla ovalifolia* (A. Gray) A. C. Sm. in *Contr. U. S. Nat. Herb.* 37: 85. 1967; J. W. Parham, Pl. Fiji Isl. ed. 2. 211. 1972.

Anplectrum ovalifolium A. Gray, Bot. U. S. Expl. Exped. 1: 597. 1854; Seem. Viti, 436. 1862, Fl. Vit. 88. 1866; Bakh. f. in *Meded. Bot. Mus. Herb. Rijks Univ. Utrecht* 91: 24. 1943.

Melastomacea Seem. in *Bonplandia* 9: 256. 1861.

Medinilla Seem. in *Bonplandia* 9: 256. 1861, Viti, 436. 1862.

Medinilla amoena Seem. Fl. Vit. 88. 1866; Triana in Trans. Linn. Soc. **28**: 87. 1871; Drake, Ill. Fl. Ins. Mar. Pac. 172. 1890; Cogn. in DC. Monogr. Phan. 7: 590. 1891; A. C. Sm. in Sargentina **1**: 85. 1942; J. W. Parham, Pl. Fiji Isl. 148. 1964.

Aplectrum ovalifolium Naud. ex Seem. Fl. Vit. 88, pro syn. 1866.

Medinilla parvifolia Seem. Fl. Vit. 89. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 172. 1890; Gillespie in Bishop Mus. Bull. **83**: 26. fig. 33. 1931.

Allomorpha ovalifolia Triana in Trans. Linn. Soc. **28**: 74. 1871; Cogn. in DC. Monogr. Phan. 7: 465. 1891; J. W. Parham, Pl. Fiji Isl. 145, as *Allomorpha o.* 1964.

Medinilla parviflora Seem. ex Triana in Trans. Linn. Soc. **28**: 89. 1871; Cogn. in DC. Monogr. Phan. 7: 603. 1891.

A liana with the stem appressed to tree trunks, or perhaps rarely a shrub, occurring from near sea level to 1,075 m, in dense or open forest, thickets of crests, or rarely in beach thickets. The usually axillary inflorescences have branches, pedicels, bracts, and bracteoles that are pale to rich pink, rarely greenish with a red tinge or brownish pink; the hypanthium is dull white to rich pink, the petals are pink to deep red, the filaments and style white, the anthers yellow and usually with reddish purple basal lobes; and the fruit is pink to purple and eventually black. Flowers and fruits seem to occur throughout the year.

TYPIFICATION AND NOMENCLATURE: My 1967 comments indicate the need to combine the three binomials under which this frequent species was originally described. The type of *Aplectrum ovalifolium* is *U. S. Expl. Exped.* (US 47676 HOLOTYPE), collected in 1840 at Mbua Bay, Mbua Province, Vanua Levu; that of *Medinilla amoena* is *Seemann 182* (K HOLOTYPE; ISOTYPES at BM, GH), collected in August or September, 1860, in the vicinity of Namosi Village, Namosi Province, Viti Levu; and that of *M. parvifolia* is *Seemann 178* (K HOLOTYPE), obtained Aug. 24, 1860, from the summit of Mt. Voma, also in Namosi Province. The last name was erroneously transcribed as *M. parviflora* by Triana and Cogniaux.

DISTRIBUTION: Endemic to Fiji and thus far known from the two largest islands and Ovalau. About 45 collections have been studied.

LOCAL NAMES: *Mimiloro, wa liva, lewandomondomo.*

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 40*; upper slopes of Mt. Koromba, *Smith 4646*; south of Nandarivatu, *Gillespie 4234*. NANDRONGA & NAVOSA: Nausori Highlands, *Vetawa 28*; vicinity of Mbalo, near Vatukarasa, *Tabualewa 15638*. SERUA: Vicinity of Ngaloa, *Degener & Ordóñez 13616*; Koromba Beach, Ndeumba, *DA 16018*. NAMOSI: Vicinity of Namosi, *Gillespie 2875*; Mt. Voma, *DA 11644*. NAITASIRE: Mendrausuthu Range, *DA 15480*. REWA: Mt. Korombamba, *Gillespie 2392*. OVALAU: Mt. Tana Lailai, *Graeffe*. Dec. 1864; summit of Mt. Ndelaiovalau and adjacent ridge, *Smith 7601*; vicinity of Levuka, *Gillespie 4551*. VANUA LEVU: MBUA: Navotuvotu, summit of Mt. Seatura, *Smith 1666*. MATHUATA: Southern base of Mathuata Range, north of Natua, *Smith 6863*. THAKAUNDRIVE: Savusavu Bay region, *Degener & Ordóñez 13939*.

6. *ASTRONIDIUM* A. Gray in Proc. Amer. Acad. Arts **3**: 53. 1853, Bot. U. S. Expl. Exped. **1**: 581. 1854; Seem. Fl. Vit. 87. 1866; Markgraf in Notizbl. Bot. Gart. Berlin **12**: 47. 1934; A. C. Sm. in Sargentina **1**: 87. 1942; Veldkamp in Taxon **32**: 134. 1983. Nom. cons. prop.

Lomanodia Raf. Sylva Tellur. 97. 1838. Nom. rejic. prop.

Astronia sensu Seem. Fl. Vit. 85. 1866, et auct.; non Bl.

Naudinia Dec. ex Seem. Fl. Vit. 85, nom. illeg. 1866; non A. Rich. (1846, nom. rejic.) nec Planch. & Linden (1853, nom. cons.).

Naudiniella Krasser in Engl. & Prantl, Nat. Pflanzenfam. III. 7: 195. 1893.

Trees or shrubs, the leaf blades usually 3- or 5-nerved, with obvious cross-venation, entire or crenulate and slightly recurved at margin; inflorescences terminal or axillary, cymose, often trichotomous, often many-flowered, with nodal bracts and bracteoles; flowers ♂; hypanthium cupuliform, the calyx limb closed in bud, usually rupturing

irregularly into 4-11 (-20) lobes; petals 4-9, oblong; stamens (6-) 8-18, essentially equal, the filaments short, the anthers oblong, dehiscent by lateral clefts, sharply recurved, the connective not dorsally enlarged but with an obvious basal spur; ovary inferior, (2-) 3-9-locular, the placentae conspicuous, clavate, erect from inner angles, the ovules numerous, the style carnosous, columnar; fruit a depressed-globose berry, the seeds numerous, obovoid or dolabriform or oblong-clavate, the persistent vascular skeleton and erect placentae conspicuous.

TYPE SPECIES AND NOMENCLATURE: *Astronidium* is based on *A. parviflorum* A. Gray, the only original species. *Lomanodia* is lectotypified by *L. glabra* (Forst. f.) Raf. (*Melastoma glabrum* Forst. f.) = *Astronidium glabrum* (Forst. f.) Markgraf (cf. Veldkamp, 1983, cited above). In proposing the conservation of *Astronidium* A. Gray over *Lomanodia* Raf., Veldkamp (like ING, 1979) dated Gray's genus from 1854, overlooking its valid publication in the descriptio generico-specifica of 1853. *Melastoma glabrum* Forst. f. is also the basis of *Naudinia* Dec. ex Seem. (*Naudinia glabra* (Forst. f.) Dec. ex Seem. Fl. Vit. 86. 1866), for which *Naudiniella* is a substitute name (*Naudiniella glabra* (Forst. f.) Krasser).

DISTRIBUTION: Borneo, the Philippines, New Guinea, and Micronesia eastward to the Society Islands; about 40 species are thus far recognized, but there are perhaps 50 or more (Veldkamp, 1983). In Fiji I here account for 15 species, all endemic.

USEFUL TREATMENTS OF GENUS: MARKGRAF, F. Die Gattung *Astronidium* A. Gray. Notizbl. Bot. Gart. Berlin 12: 47-50. 1934. SMITH, A. C. *Astronidium* A. Gray. Sargentia 1: 87-95. 1942.

The characters that separate *Astronidium* from *Astronia* were discussed by Markgraf (1934) and the present writer (1942), but Bakhuizen (in Backer & Bakh. f. Fl. Java 1: 370. 1963) has remarked in a footnote to *Astronia*: "*Astronidium* A. Gray is in my opinion congeneric!" This opinion was followed by van Balgooy (in *Blumea* Suppl. 5:

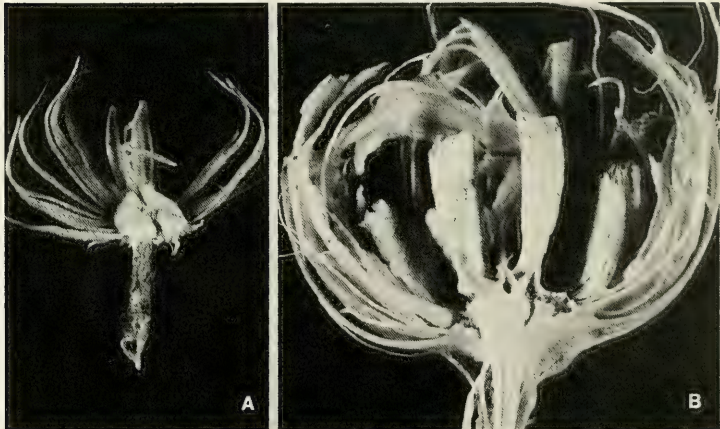


FIGURE 74. A, *Astronia rolfei* S. Vidal; shattered fruit, lacking seeds but showing vasculature and the 2 flattened placentae, $\times 6$. B, *Astronidium macranthum*; shattered fruit, lacking seeds but showing vasculature and the prominent, clavate placentae, $\times 6$. A from *Elmer 13685* (Mindanao, Philippines), B from *Smith 1525*.

224. 1966, in op. cit. 6: 181. 1971), who indicates *Astronia* and *Astronidium* as sections, although sections had not been discussed by Bakhuizen in 1943. However, in that paper (in Meded. Bot. Mus. Herb. Rijks Univ. Utrecht 91: 33) Bakhuizen in his discussion of *Astronia* had remarked: "So far as it is known to me, the genus is very homogeneous and its delimitation from *Astrocalyx*, *Beccarianthus*, *Everettia* and *Naudiniella* offers no difficulties." Since *Naudiniella* and *Astronidium* are certainly congeneric (cf. Markgraf, 1934; Veldkamp, 1983), Bakhuizen would seem to have contradicted himself.

At any rate, the recognition of *Astronidium* as a discrete genus is now supported by van Vliet (in *Blumea* 27: 401. 1981) as well as Veldkamp (1983), and one must assume that the name will be conserved over the earlier *Lomanodia* Raf. In addition to several quite dependable floral characters that separate *Astronia* and *Astronidium*, the placental character is observable even in shattered fruits, the placentae of *Astronia* being usually two and flattened or pulvinate (FIGURE 74A), while those of *Astronidium* are usually four or more and conspicuously clavate (FIGURE 74B).

Most Fijian species of *Astronidium* are strikingly distinct from one another, but characters referring to the indument, leaf venation, and size of flower parts and fruits must be utilized. The only group of species which presents difficulties in identification is the complex including *A. parviflorum*, *A. floribundum*, *A. victoriae*, and *A. degeneri*; below I have added comments that will hopefully clarify the relationships among these.

KEY TO SPECIES

- Each pair of leaves subtended by large, persistent, stipulelike organs forming a sheath, the blades of these 3-10 mm. long, marginally auriculate, and contiguous across the interpetiolar ridge; leaf blades usually 17-25 × 8-13 cm.; indument composed of coarse, multicellular hairs 0.3-1 mm. long; flowers comparatively small, the petals 2.8-3.2 mm. long, the anthers 2-2.2 mm. long. 1. *A. saulae*
- Each pair of leaves without subtending organs.
- Leaf blades glabrous beneath (sometimes brown-furfuraceous or -lepidoate on nerves and surfaces when young, but not persistently so).
- Flowers comparatively small, the hypanthium 2-6 mm. long and in diameter at anthesis, the calyx lobes inconspicuous, less than 1 mm. long, the petals 4-6, less than 7 × 4 mm., the anthers 2-5 mm. long; mature fruits 3-8 mm. in diameter.
- Pedicels short, usually less than 1 mm. long, the flowers and fruits essentially sessile (pedicels very rarely to 2 mm. long, but then the indument characteristic); young parts densely brown-furfuraceous-puberulent, a similar indument subsistent on inflorescence and infructescence. 2. *A. confertiflorum*
- Pedicels obvious, at least 1.5 mm. long (or if shorter then the young parts and inflorescences essentially glabrous).
- Calyx limb splitting into 4-6 lobes (these rarely to 8 in fruiting calyces, but then the mature fruits not exceeding 5 mm. in diameter).
- Leaf blades 4.5-18 × 1.7-8.5 cm., usually more than twice as long as broad; petals 4, small, 2.5-3 mm. long; hypanthium at anthesis 2-3 mm. long; stamens 8 (rarely 6), the anthers 2-2.5 mm. long; style 2-3.5 mm. long; ovary locules usually 4. 3. *A. parviflorum*
- Leaf blades 4.5-8 × 2.5-3.5 cm., usually less than twice as long as broad; petals 5 or 6, larger, 5-7 mm. long; hypanthium at anthesis 4-4.5 mm. long; stamens 10 or 12, the anthers 3.5-4.5 mm. long; style about 6 mm. long; ovary locules usually 3. 4. *A. floribundum*
- Calyx limb splitting into 8-11 or more lobes or essentially truncate, the mature fruit 4-8 mm. in diameter.
- Leaf blades elliptic or oblong or ovate, the outer collecting nerve usually more than 1 mm. from margin; hypanthium about as broad as long, minutely furfuraceous-lepidote when young, often persistently so, the calyx limb erect and with small but obvious lobes; anthers 3.5 mm. long or less. 5. *A. victoriae*
- Leaf blades elliptic to obovate, the outer collecting nerve less than 1 mm. from margin; hypanthium broader than long, glabrous, the calyx limb incurved and essentially truncate at apex; anthers 4-5 mm. long. 6. *A. inflatum*

Flowers comparatively large, the hypanthium 7-12 mm. long and in diameter at anthesis, the calyx lobes large, 1-5 mm. long, the petals 6-10, large, 7-12 mm. long, 3-7 mm. broad, the anthers 4-9 mm. long; mature fruits 8-15 mm. in diameter.

Leaf blades (6-) 7-18 × (2-) 3-7.5 cm., 3-nerved, the fourth and fifth nerves inconspicuous, 2 mm. or less from margin.

Inflorescences ample, many-flowered, 9-17 cm. broad; petals 7-8 mm. long, 3-4 mm. broad; anthers 4-5.5 mm. long; mature fruits 8-10 mm. in diameter. 7. *A. degeneri*

Inflorescences compact, few-flowered, not more than 12 cm. broad even in fruit; flowers and fruits larger than in the preceding (although mature flowers not known for no. 9).

Young parts and hypanthium sparsely and evanescently lepidote; leaf blades elliptic or obovate, 8-14 × 4-7.5 cm.; inflorescence bracts suborbicular, 5-7 mm. in diameter, evanescent; petals and ovary locules 6-9, the placentae in fruit comparatively short-stalked, the seminiferous portion 3-3.5 mm. long. 8. *A. macranthum*

Young parts and hypanthium copiously and subsersistently lepidote; leaf blades lanceolate-elliptic, 11-18 × 3.5-6 cm.; inflorescence bracts conspicuous, broadly elliptic, up to 22 × 15 mm.; petals and ovary locules 5, the placentae in fruit 2.5-3 mm. long, obviously stalked, with a seminiferous portion about 1.5 mm. long. 9. *A. lepidotum*

Leaf blades 11-32 × 5-30 cm., 5-nerved, the fourth and fifth nerves 2-7 mm. within margin, paralleled by a fainter collecting nerve.

Leaves petiolate, the petioles obvious, 1.2-10 cm. long, the blades elliptic, 11-32 × 5-30 cm., obtuse or subcordate to acute at base, the 3 inner nerves oriented from near base or joined up to 2.5 cm.; inflorescence bracts obovate, about 15 × 8 mm., soon caducous. 10. *A. robustum*

Leaves clustered and appearing essentially sessile, the petioles stout, less than 1 cm. long, the blades lanceolate-obovate, 17-25 × 6.5-9.5 cm., tapering proximally, the 3 inner nerves joined 3-4.5 cm. above base; inflorescence bracts orbicular, 12-15 mm. in diameter, subsistent.

11. *A. sessile*

Leaf blades densely and persistently brown-pubescent or -lepidote beneath.

Leaves comparatively small, the blades 5-9 × 2-4.5 cm., the lower surfaces, inflorescence branches, hypanthia, etc., completely clothed by a layer of minute, ciliolate or stellate scales less than 0.1 mm. in diameter. 12. *A. tomentosum*

Leaves larger, the blades 10-30 × 4-13 cm., the lower surfaces, inflorescence branches, hypanthia, etc., less closely clothed than in the preceding, the hairs simple, spreading, many-celled.

Inflorescences, leaf blades beneath, etc., subhispid with subulate hairs 0.8-5 mm. long.

13. *A. storckii*

Inflorescences, leaf blades beneath, etc., tomentelous or puberulent with often clavate hairs 0.1-0.7 mm. long.

Leaf blades ovate-elliptic, 7-12 cm. broad, rounded to obscurely subcordate at base, the fourth and fifth nerves 4-5 mm. within margin and conspicuously connected by transverse veinlets to an obvious submarginal nerve; flowers (as far as known) 4-merous. 14. *A. kasiense*

Leaf blades oblong-lanceolate, 4-7.5 cm. broad, obtuse at base, the fourth and fifth nerves submarginal, 1-2 mm. within margin and lacking conspicuous exterior veinlets; flowers (as far as known) 5-merous. 15. *A. pallidiflorum*

1. *Astronidium saulae* A. C. Sm. in Pacific Sci. 25: 497. 1971. FIGURE 75A-C.

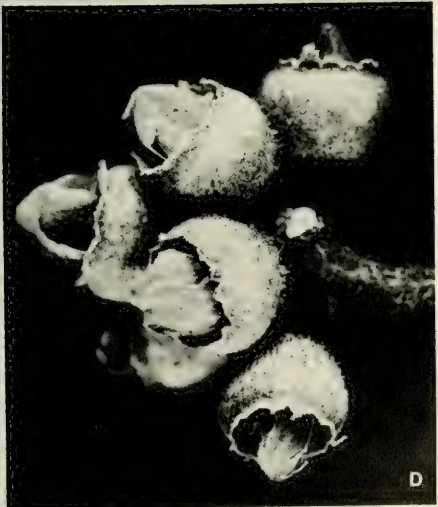
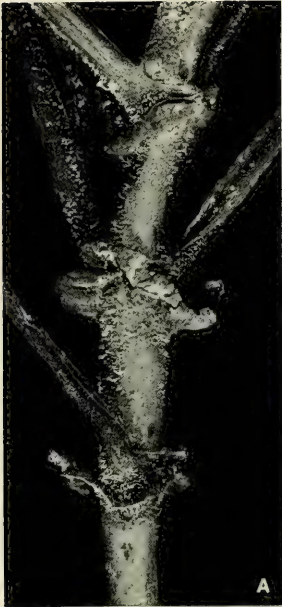
A slender tree 3-10 m. high, very local in dense forest at 200-300 m. Flower colors are not noted, but probably the petals are white or pink-tinged; the available flowers are uniformly 4-merous. Flowers have been obtained in April and fruits in July.

TYPIFICATION: The type is *DA 17273* (coll. *Saula Vodonaivalu*) (BISH HOLOTYPE; ISOTYPES AT A, BRI, CHR, K, MASS, NY, SUVA), collected April 27, 1970, on the southern slope of Mt. Korombamba, Rewa Province, Viti Levu.

DISTRIBUTION: This recently discovered novelty, known from a single colony at the type locality but collected there several times, is so striking as to obviate comparison with its congeners. It serves to call attention to the fact that spectacular botanical discoveries may be still be made in the Viti Levu forest a few miles away from Suva.

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Southern slope of Mt. Korombamba, *DA 16529, 17218, 17357*.

FIGURE 75. A-C, *Astronidium saulae*: A, distal portion of branchlet, with basal parts of petioles and subtending stipulelike organs, × 2; B, inflorescence, × 6; C, stamen, × 30. D, *Astronidium confertiflorum*; ultimate cluster of flowers, showing short pedicels and copious indument, × 6. A-C from *DA 17273*, D from *Smith 7785*.



2. *Astronidium confertiflorum* (A. Gray) Markgraf in Notizbl. Bot. Gart. Berlin 12: 49. 1934; A. C. Sm. in Sargentia 1: 89. 1942; J. W. Parham, Pl. Fiji Isl. 145. 1964, ed. 2. 207. 1972. FIGURE 75D.

Astronia confertiflora A. Gray, Bot. U. S. Expl. Exped. 1: 579. 1854; Seem. Fl. Vit. 86. 1866; Triana in Trans. Linn. Soc. 28: 152, as *A. consertiflora*. 1871; Drake, Ill. Fl. Ins. Mar. Pac. 172. 1890; Cogn. in DC. Monogr. Phan. 7: 1097. 1891.

A tree 3–15 m. high, occurring at elevations of 100–1,050 m. in dense or secondary forest or in patches of forest in open areas. The petals are pink when young but soon become pure white; the stamens are also white, and the fruit is yellowish. Flowers and fruits have been obtained in most months.

TYPE: *Astronia confertiflora* is typified by *U. S. Expl. Exped.* (us 47700 HOLOTYPE; ISOTYPE at GH), collected in 1840 in Mbua Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and now known from five of the high islands. About 35 collections are available. The reference of this species to Samoa by Reinecke (in Bot. Jahrb. 25: 662. 1898) is based on *Reinecke 563* from Savaii, a specimen that doubtless belongs to the Samoan endemic *Astronidium subcordatum* (A. Gray) Christophersen.

LOCAL NAME: *Ndava*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Eastern slope of Mt. Koroyanitu, Mt. Evans Range, *Smith 4245*; Mt. Tomanivi, *O. & I. Degener 32066*. NANDRONGA & NAVOSA: Nausori Highlands, *O. & I. Degener 32156*. SERUA: Nathengathenga Creek, upper Navua River, *DF 974 (Vakarewa 2)*. NAMOSI: Nambukavesi Creek, *Bola 40*. NAITASIRE: Viria, *DA 500*; Central road, *Tohill 161*. TAILEVU: Forest Reserve No. 1, *DA*, May 1938. REWA: Mt. Korombamba, *Parks 20338*. KANDAVU: Kiombo, *DA 11921*. NGAU: Hills east of Herald Bay, *Smith 7785*. VANUA LEVU: MBUA: Koromba Forest, Wairiki, *DA 15132*. MATHUATA: Southern base of Mathuata Range, north of Natua, *Smith 6823*. THAKAUNDROVE: Latiki, trail to Mt. Soro Levu from Savusavu, *DA 17172*; Navonu Creek, Natewa Peninsula, *DA 15061*. TAVEUNI: Above Somosomo, *Gillespie 4833*.

3. *Astronidium parviflorum* A. Gray in Proc. Amer. Acad. Arts 3: 53. 1853, Bot. U. S. Expl. Exped. 1: 582. 1854, Atlas, pl. 72, C. 1856, in Proc. Amer. Acad. Arts 5: 317. 1862, in Bonplandia 10: 35. 1862; Seem. Viti, 436. 1862, Fl. Vit. 87. 1866; Markgraf in Notizbl. Bot. Gart. Berlin 12: 49. 1934; A. C. Sm. in Sargentia 1: 90. 1942; J. W. Parham, Pl. Fiji Isl. 147. 1964, ed. 2. 208. 1972.

Astronia pickeringii sensu Seem. in Bonplandia 9: 256. 1861; non A. Gray.

Astronia fraterna sensu Seem. Fl. Vit. 85, p. 1866; non A. Gray.

Astronia parviflora Triana in Trans. Linn. Soc. 28: 152. 1871; Drake, Ill. Fl. Ins. Mar. Pac. 173. 1890; Cogn. in DC. Monogr. Phan. 7: 1099. 1891.

A shrub or tree 2–12 m. high (or sometimes smaller on exposed crests), occurring at elevations of 100–1,195 m. in dense forest or in thickets of crests and ridges. Its inflorescence has pink-tinged bracts that are soon caducous; the hypanthium is green to rich pink, the petals are white and often pale pink distally, and the filaments and style are white or greenish white. Flowers and fruits do not seem seasonal.

TYPE AND NOMENCLATURE: In 1853 Gray cited the species merely from "Feejee Islands;" in 1854 he listed "Ovalau and Ambau" (i. e. Ovalau and Mbau Island in the present Tailevu Province, Viti Levu). However, none of the available Exploring Expedition specimens have detailed labels, and the best citation is: *U. S. Expl. Exped.* (us 47702 HOLOTYPE; putative ISOTYPES at GH, NY), collected in 1840 either on Ovalau or on Mbau Island (where it must have been cultivated from a wild plant). Seemann's references to *Astronia pickeringii* and *A. fraterna* are based on misidentifications of his own and Milne's collections cited below.

DISTRIBUTION: Endemic to Fiji and thus far known from four of the high islands; about 30 collections are at hand. The species has been recorded from Samoa by Reinecke (in Bot. Jahrb. **25**: 662. 1898) and Christophersen (in Bishop Mus. Bull. **154**: 32. 1938), but I believe that the cited specimens are better referred to *Astronidium navigatorum* Christophersen (in op. cit. **154**: 31. fig. 9. 1938).

LOCAL NAMES: *Tavo, wai susu, mothe lutu.*

REPRESENTATIVE COLLECTIONS: VITI LEVU: *Milne 83*, p. p., 295. MBA: Summit of Mt. Koroyanitu, high point of Mt. Evans Range, *Smith 4230*. NAMOSI: Summit of Mt. Naitarandamu, *Gillespie 3240*; Mt. Voma, *Seemann 173*; Mt. Vakarongasiu, *DA 14707*; Nambukavesi Creek, *DA 13875 (DF 196, Bola 58)*. NAITASIRE: Mendrausuthu Range, *DA 15464*; Tholo-i-suva, *DA 16941*. REWA: Na Vesi, *Horne 1038*. OVALAU: Summit of Mt. Ndelaiovalau and adjacent ridge, *Smith 7375*; summit of Mt. Tana Lailai and adjacent ridge, *Smith 7711*. VANUA LEVU: MBUA: Upper Ndama River valley, *Smith 1586*. THAKAUNDROVE: Mt. Uluingala, Natewa Peninsula, *Smith 1987*. TAVEUNI: Vicinity of Waiyevo, *Gillespie 4726*; above Nggathavulo Estate, *DA 16908*.

4. *Astronidium floribundum* (Gillespie) A. C. Sm. in *Sargentia* **1**: 90. 1942; J. W. Parham, Pl. Fiji Isl. **45**. fig. 55, *A.* 1964, ed. 2. 208. fig. 61, *A.* 1972.

Astronia floribunda Gillespie in Bishop Mus. Bull. **83**: 24. fig. 30. 1931.

A small tree not sharply differentiated from *Astronidium parviflorum*, but distinguishable in flower by its more numerous and larger petals and stamens, its larger hypanthium, and its longer style. There is also a slight difference in the proportions of the leaf blades. I believe that *A. floribundum* may be maintained as a rare and local endemic.

TYPIFICATION: The type is *Gillespie 2246* (BISH HOLOTYPE; ISOTYPES at GH, UC), collected Aug. 15, 1927, at about 400 m. on the upper southeastern slope of Mt. Korombamba, Rewa Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from the type collection.

5. *Astronidium victoriae* (Gillespie) A. C. Sm. in *Sargentia* **1**: 91. 1942; J. W. Parham, Pl. Fiji Isl. **147**. fig. 55, *B.* 1964, ed. 2. 210. fig. 61, *B.* 1972. FIGURE 76A.

Astronia pickeringii A. Gray, Bot. U. S. Expl. Exped. **1**: 577, p. p. 1854; Seem. Viti, 436, p. p. 1862, Fl. Vit. 86, p. p. 1866; sensu Triana in Trans. Linn. Soc. **28**: 152. 1871; Drake, Ill. Fl. Ins. Mar. Pac. 173, p. p. 1890; non sensu typi.

Astronia pickeringii var. *vitiensis* A. Gray, Bot. U. S. Expl. Exped. **1**: 578. 1854; Atlas, pl. 72, *B* (excl. fig. 1-8). 1856; Seem. Fl. Vit. 86. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 173. 1890; Cogn. in DC. Monogr. Phan. **7**: 1095. 1891.

Astronia victoriae Gillespie in Bishop Mus. Bull. **83**: 25. fig. 32. 1931.

A shrub or tree (2-) 3-12 m. high, slender or freely branched, occurring at elevations of 100-1,323 m. (high point of Viti Levu), in dense or open forest or in crest thickets. The hypanthium is green, yellowish distally; the petals, filaments, and style are white. Flowers and fruits do not appear seasonal.

TYPIFICATION AND NOMENCLATURE: In my 1942 treatment I discussed the typification of *Astronia pickeringii*, which Gray had originally described with two varieties, *samoensis* and *vitiensis*, suggesting that the first variety should be taken to typify the species, in this sense a Samoan endemic now known as *Astronidium pickeringii* (A. Gray) Christophersen (in Bishop Mus. Bull. **154**: 32. 1938). At the specific level, therefore, the epithet *victoriae* has priority for the Fijian species. The type of *Astronia pickeringii* var. *vitiensis* is U. S. Expl. Exped. (US 47697) HOLOTYPE; ISOTYPE at GH), collected in 1840 on Ovalau; that of *Astronia victoriae* is *Gillespie 4101* (BISH HOLOTYPE; ISOTYPES at GH, UC), collected Nov. 29, 1927, near the summit of Mt. Tomanivi (Mt. Victoria), Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from Viti Levu, Ovalau, and Moala; I have examined about 35 collections.

LOCAL NAMES: The many names recorded for this species by collectors are *tava*, *tavo*, *tavotavo*, *tuvaluva*, *tavola*, *ndiriniu*, *sorovulu*, *kaurasinga ni veikau*, and *wai susu*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, *Degener 14798*; Mt. Nanggaranambuluta, *DA 13553*; Navai, *DA 13732 (DF 177 or 772)*; summit of Mt. Tomanivi, *Smith 5186*. NANDRONGA & NAVOSA: Nambosewale, Nandrau, *DF 1173*; northern portion of Rairaimatuku Plateau, between Nandrau and Nanga, *Smith 5464*. SERUA: Inland from Ngaloa, *Howard 210*. NAMOSI: Slopes of Mt. Voma, *Gillespie 2495*. RA: Ridge from Mt. Namama (east of Nandarivatu) toward Mt. Tomanivi, *Smith 5701*; vicinity of Nasukamai, *Gillespie 4396.1*. NAITASIRI: South of Matawailevu, Wainimala River, *St. John 18230*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7220*. OVALAU: *Graeffe 1584*; hills west of Lovoni Valley, south of Mt. Korolevu, *Smith 7659*; Mt. Korotolutolu, west of Thawathi, *Smith 8038*. MOALA: *Bryan 314*; Ndelaimoala, *Smith 1363*.

Astronidium victoriae may be found sometimes difficult to separate from *A. parviflorum*, the key character here used pertaining to the degree of splitting of the calyx limb not always being decisive. However, if flowers are available, the petals and anthers of *A. victoriae* are distinctly the larger, and its fruits are substantially larger. Even in flower or advanced bud the hypanthium of *A. victoriae* is larger than the mature fruit of *A. parviflorum*.

6. *Astronidium inflatum* (A. C. Sm.) A. C. Sm. in *Sargentia* 1:92. 1942; J. W. Parham, *Pl. Fiji Isl.* 146. 1964, ed. 2. 208. 1972. FIGURE 77C.

Astronia inflata A. C. Sm. in *Bishop Mus. Bull.* 141: 114. fig. 60. 1936.

A shrub or slender tree 2–4 m. high, occurring at elevations of 700–1,030 m. (high point of Vanua Levu) or perhaps lower, in dense forest or crest thickets or on open hillsides. The hypanthium is pink, becoming deeper in color within the calyx limb as it matures, and the petals are white. Flowers have been obtained in June and November and mature fruits in April.

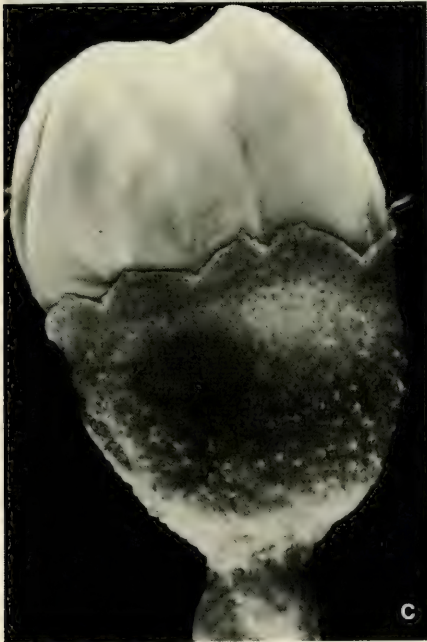
TYPIFICATION: The type is *Smith 1875* (BISH HOLOTYPE; many ISOTYPES), collected June 5, 1934, on the eastern buttress of Mt. Ndikeya, Thakaundrove Province, Vanua Levu.

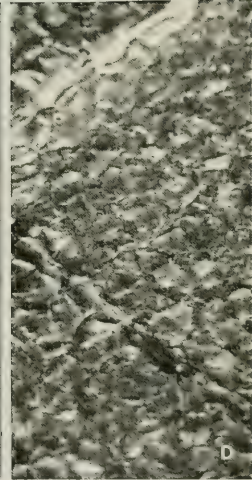
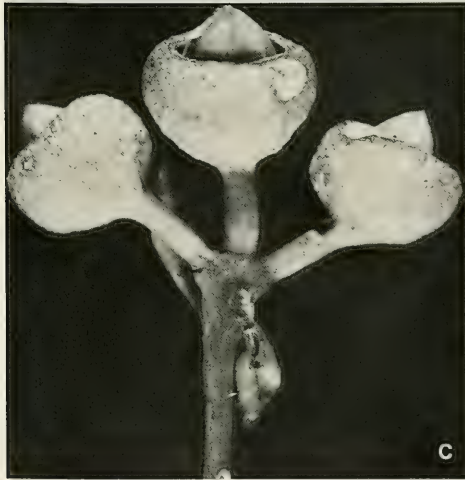
DISTRIBUTION: Endemic to Fiji and thus far known only from Vanua Levu; only five collections have been seen.

AVAILABLE COLLECTIONS: VANUA LEVU: "From the interior of Vanua Levu," *Horne 616*. MBUA: Navotuvotu, summit of Mt. Seatura, *Smith 1645*. MATHUATA: "Vicinity of Wainikoro," *Greenwood 704*. THAKAUNDROVE: Summit of Mt. Mbatini, *Smith 707*.

While the closest relationships of this species appear to be with *Astronidium victoriae*, it differs from that in the obvious characters mentioned in the key, particularly in its broad hypanthium and incurved calyx limb. As far as known, the two species have discrete distributions. Greenwood's locality refers to the Wainikoro River, which enters the sea about 25 km. east of Lambasa. His no. 704 is not likely to have come from the lower part of the river, some of the branches of which drain high areas of both Mathuata and Thakaundrove Provinces, although the elevation was probably less than 700 m.

FIGURE 76. A, *Astronidium victoriae*; ultimate clusters of flowers, $\times 6$. B, *Astronidium degeneri*; ultimate cluster of flowers, $\times 6$. C & D, *Astronidium macranthum*: C, flower, $\times 6$; D, stamens, $\times 6$. A from *DA 11847*, B from *DA 13332*, C & D from *Smith 1706*.





7. *Astronidium degeneri* A. C. Sm. in *Sargentia* 1: 93. 1942, in *J. Arnold Arb.* 33: 103. 1952; J. W. Parham, *Pl. Fiji Isl.* 145. 1964, ed. 2. 208. 1972. FIGURE 76B.

A shrub or tree 2–13 m. high, found in open dry forest or on edges of forest or along watercourses in open country, at elevations of about 60–900 m. The only available color notes indicate that the petals are white. Flowers have been found in April and May, and fruits between May and October.

TYPEFICTION: The type is *Degener 15279* (A HOLOTYPE; ISOTYPES at BISH, K, US), collected May 15, 1941, near Yawe, vicinity of Mbalo, near Vatukarasa, Nandronga & Navosa Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from western Viti Levu. Only nine collections seem to represent the species.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 255, 931, 1304*; Natualevu, Mt. Evans Range, *DA 14187*; northern portion of Mt. Evans Range, between Mt. Vatuyanitu and Mt. Natondra, *Smith 4359*; Vunanamo, *DA 14793*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 12634* (*Melville et al. 7005*); vicinity of Nausori Village, *DA 13332*.

Astronidium degeneri may sometimes be difficult to distinguish from *A. victoriae* in the absence of mature flowers or fruits, as the foliage of the two species is quite similar. On the basis of present collections the first is known definitely only from the western parts of Viti Levu; the second, as it occurs on that island, is known from central and eastern areas of it. The following subsidiary key may prove useful:

Pedicels 2–4 mm. long; calyx limb rupturing into 8–11 lobes, these as many as 20 in fruit but less than 1 mm. long; mature fruits 4–8 mm. in diameter; petals 4–5 × 3–3.5 mm.; anthers 3–3.5 mm. long.

A. victoriae

Pedicels 1 mm. long or less; calyx limb rupturing into 4–6 lobes, these not more than 8 in fruit and 1–3 mm. long; mature fruits 8–10 mm. in diameter; petals 7–8 × 3–4 mm.; anthers 4–5.5 mm. long.

A. degeneri

In spite of its short pedicels *Astronidium degeneri* cannot be confused with *A. confertiflorum*, in which the indument of young parts and inflorescences is conspicuous and the smaller flowers are closely congested and numerous on the ultimate inflorescence branches.

8. *Astronidium macranthum* (A. C. Sm.) A. C. Sm. in *Sargentia* 1: 93. 1942; J. W. Parham, *Pl. Fiji Isl.* 147. 1964, ed. 2. 208. 1972. FIGURES 74B, 76C & D.

Astronia macrantha A. C. Sm. in *Bishop Mus. Bull.* 141: 113. fig. 59. 1936.

A shrub or spreading tree 1.5–6 m. high, with white petals, occurring at elevations of 50–900 m. in open dry forest or on edges of forest. Flowers have been noted in May and July and fruits in April, May, and December.

TYPEFICTION: The type is *Smith 1706* (BISH HOLOTYPE; many ISOTYPES), collected May 2, 1934, in the southern portion of the Seatovo Range, Mbua Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji, but known only from five collections and presumably only from the two largest islands. The Harvey collection cited below may have come from Mbua Province, the source of much of his Fijian material.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Namosau Creek area, inland from Mba, *DA 10884*; near Vatuthere, vicinity of Nandarivatu, *Gillespie 4270*. VANUA LEVU: MBUA: Southern portion of Seatovo Range, *Smith 1525*. FIJI without further locality, *Harvey*, Nov. 1855.

FIGURE 77. A & B, *Astronidium tomentosum*; A, distal portion of branchlet, with foliage and an inflorescence, × 1/3; B, flowers congested in distal part of inflorescence, × 6. C, *Astronidium inflatum*; ultimate cluster of flowers, × 6. D, *Astronidium lepidotum*; scales on lower surface of young leaf blade, × 20. A & B from *DA 11655*, C from *Smith 1875*, D from *DA 13640*.

9. *Astronidium lepidotum* A. C. Sm. in Pacific Sci. 23: 386. 1969; J. W. Parham, Pl. Fiji Isl. ed. 2. 208. 1972. FIGURE 77D.

A slender tree about 6 m. high, occurring in forest at an elevation of less than 200 m. Although the species is highly distinctive, the available data are inadequate to suggest flower colors or dates.

TYPIFICATION: The type is *DA 13640* (coll. *I. Qoro & I. T. Kuruvoli*) (BISH HOLOTYPE; ISOTYPE at SUVA), collected Jan. 15, 1964, near the Copper Mine, Waimaro River, Tailevu Province, Viti Levu.

DISTRIBUTION: The species is known from only two collections, the type with young inflorescences and a second with old fruits but lacking locality data. The similarity of the material inclines me to believe that the fruiting specimen is from the type locality.

AVAILABLE COLLECTION: FIJI without further data, *DA s. n.*, without date.

10. *Astronidium robustum* (Seem.) A. C. Sm. in Sargentia 1: 92. 1942; J. W. Parham, Pl. Fiji Isl. 147. 1964, ed. 2. 208. 1972.

Melastomacea Seem. in Bonplandia 9: 256. 1861, Viti, 436. 1862.

Astronia robusta Seem. Fl. Vit. 86. 1866; Triana in Trans. Linn. Soc. 28: 152. 1871; Drake, Ill. Fl. Ins. Mar. Pac. 173. 1890; Cogn. in DC. Monogr. Phan. 7: 1096. 1891; Gillespie in Bishop Mus. Bull. 83: 25. fig. 31. 1931.

A slender, spreading, or freely branched tree 2–15 m. high, growing in dense forest and often along creeks or on river banks at elevations of 50–900 m. The petals, stamens, and style have been noted as white. Flowers have been obtained between May and October and the persistent fruits throughout the year.

TYPIFICATION: The type is *Seemann 181* (K HOLOTYPE; ISOTYPE at BM), collected in August or September, 1860, in the vicinity of Namosi Village, Namosi Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and known from the three largest islands. About 35 collections are at hand.

LOCAL NAMES AND USE: Recorded local names, often generic in their application, are *thava*, *thavu*, *tavotavo*, and *tavutavu*. In Namosi Province the wood is said to be used for houseposts.

REPRESENTATIVE COLLECTIONS: VITI LEVU: SERUA: Inland from Ngaloa, *DA 14101*; hills east of Navua River, near Nukusere, *Smith 9084*. NAMOSI: Northern base of Korombasambasanga Range, in drainage of Wainavindrau Creek, *Smith 8628*; southeast of Namosi Village, *Gillespie 2869*; Navua River area, *Parks 20396*; Wainandoi River, *DA 8362*. NAITASIRI: Trail between Viria and Naisonggo, *Parks 20456*; Waimbui Creek, *DA 15567*; Prince's Road, *Vaughan 3297*. TAILLEVU: Waitata, Nameka Village, *DA 17294*. REWA: Mt. Korombamba, *Meebold 16669*. VANUA LEVU: THAKAUNDOVE: Navonu Creek, Natewa Peninsula, *DA 15048*. TAVEUNI: Edge of crater lake east of Somosomo, *DA 17117*; valley between Mt. Manuka and main ridge of island, east of Wairiki, *Smith 8310*.

11. *Astronidium sessile* (A. C. Sm.) A. C. Sm. in Sargentia 1: 93. 1942; J. W. Parham, Pl. Fiji Isl. 147. 1964, ed. 2. 210. 1972.

Astronia sessilis A. C. Sm. in Bishop Mus. Bull. 141: 111. fig. 58. 1936.

A shrub 2 m. high, found in dry forest at an elevation of 650–900 m. The single available collection, in advanced bud in November, did not permit notes on flower color except for the white petals.

TYPIFICATION: The type is *Smith 533* (BISH HOLOTYPE; ISOTYPE at NY), collected Nov. 21, 1933, on the crest of the Korotini Range, between Navitho Pass and Mt. Ndelaikoro, Mathuata–Thakaundrove boundary, Vanua Levu.

DISTRIBUTION: Known only from the type collection, the material of which permitted only a single isotype.

One of the most distinctive of Fijian *Astronidia*, the present species exemplifies, with many similar instances, our lack of knowledge of the interior forests of Vanua Levu, an island botanically less known than Viti Levu but equally interesting.

12. *Astronidium tomentosum* (Seem.) A. C. Sm. in *Sargentia* 1: 94. 1942; J. W. Parham, *Pl. Fiji Isl.* 147. 1964, ed. 2. 210. 1972. FIGURE 77A & B.

Astronia confertiflora sensu Seem. in *Bonplandia* 9: 256. 1861, Viti, 436. 1862; non A. Gray.

Astronia tomentosa Seem. *Fl. Vit.* 86. 1866; Triana in *Trans. Linn. Soc.* 28: 152. 1871; Drake, *Ill. Fl. Ins. Mar. Pac.* 173. 1890; Cogn. in *DC. Monogr. Phan.* 7: 1099. 1891.

A shrub or small tree 2–7 m. high, occurring in a limited area in the thickets of crests and summits at elevations of 600–1,200 m. Notes on flower color are lacking. Flowers were obtained in February, August (bud), and September, and fruits in June, August, and September.

TYPIFICATION: The type is *Seemann 174* (K HOLOTYPE; ISOTYPES at BM, GH), collected Aug. 24, 1860, on Mt. Voma, Namosi Province, Viti Levu. Triana (1871) erroneously cited the number as 171.

DISTRIBUTION: Endemic to Fiji and apparently to a very limited area in Namosi Province; eleven collections are available and all are here cited to illustrate the narrow montane endemism sometimes noted in Viti Levu.

LOCAL NAME: *Thava*.

AVAILABLE COLLECTIONS: VITI LEVU: NAMOSI: Summit of Korombasambasanga Range (presumably Mt. Vuimasia), *DA 2156* (coll. B. E. V. Parham); summit of Mt. Vakarongasiu, *Gillespie 3281*; Mt. Voma, at or near summit, *Gillespie 2725, 2796, DA 559, 608, 1977, 5553, 11655, 13968*.

13. *Astronidium storckii* Seem. *Fl. Vit.* 87. 1866; Markgraf in *Notizbl. Bot. Gart. Berlin* 12: 49. 1934; A. C. Sm. in *Sargentia* 1: 94. 1942; J. W. Parham, *Pl. Fiji Isl.* 147. 1964, ed. 2. 210. 1972. FIGURE 78A & B.

Astronia storckii Seem. in *Bonplandia* 10: 296, nom. nud. 1862, Viti, 436, nom. nud. 1862; Triana in *Trans. Linn. Soc.* 28: 152. 1871; Drake, *Ill. Fl. Ins. Mar. Pac.* 173. 1890; Cogn. in *DC. Monogr. Phan.* 7: 1099. 1891.

A tree 4–10 m. high, occurring in dense forest and thickets of crests and ridges at elevations of 30–1,153 m. Notes on flower color are not available, although flowers or buds and also fruits have been obtained several times in scattered months.

TYPIFICATION: The type is *Storck 890* (K HOLOTYPE; ISOTYPE at BM), collected in January, 1861, near Port Kinnaird, Ovalau.

DISTRIBUTION: Endemic to Fiji and, except for the type collection from Ovalau, known only from Viti Levu. As only 17 collections are known, all are here listed.

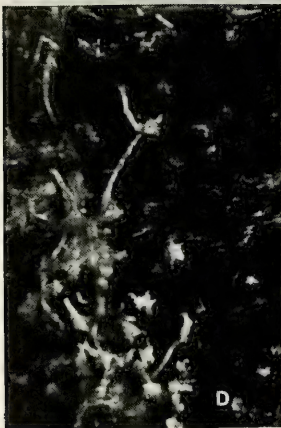
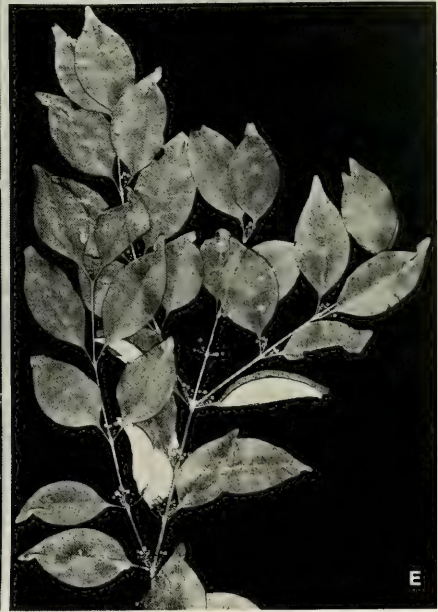
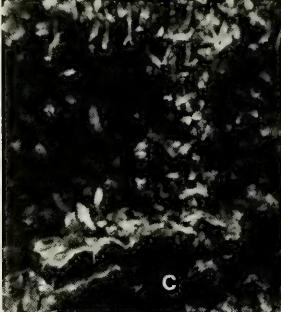
LOCAL NAMES: *Tava, tava mboko, thavathava*.

AVAILABLE COLLECTIONS: VITI LEVU: M̄BA: Mt. Ndelainathovu, on escarpment west of Nandarivatu, *Smith 4918*; east of Nandala Creek, south of Nandarivatu, *Smith 6241*; Mt. Tomanivi, *DA 12738* (*Melville et al.* 7130). NAMOSI: Summit of Mt. Naitarandamu, *Gillespie 3133*; hills bordering Wainavindrau Creek, vicinity of Wainimakutu, *Smith 8527*. NAITASIRE: Northern portion of Rairaimatuku Plateau, between Mt. Tomanivi and Nasonggo, *Smith 5763*; Waindina River, *DA 185*; Waimanu River, *DA 15844*; Sawani, *DA 7620*; Tamavua–Sawani road, *Setchell & Parks 15091*; Tholo-i-suva, *Setchell & Parks 15134*; Suva Pumping Station, *Degener & Ordonez 13745*; Nasinu, *DA 7496*. TAILEVU: Near Copper Mine, Waimaro River, *DA 13641*. REWA (?): "Heads Path, Suva," *Tothill 171*. FIJI without further locality, *Horne s. n.*

14. *Astronidium kasiense* A. C. Sm. in *Sargentia* 1: 95. 1942; J. W. Parham, *Pl. Fiji Isl.* 147. 1964, ed. 2. 208. 1972. FIGURE 78C.

Astronidium storckii sensu A. C. Sm. in *Bishop Mus. Bull.* 141: 115, p. p. 1936; non Seem.

A tree about 7 m. high, occurring in dense forest at an altitude of 300–430 m. The single available collection, in advanced bud in May, did not permit notes on flower color.



TYPIFICATION: The type is *Smith 1799* (NY HOLOTYPE; many ISOTYPES), collected May 10, 1934, on Mt. Kasi, Yanawai River region, Thakaundrove Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and known only from the type collection.

LOCAL NAME: *Rusila*.

The Mt. Kasi area has a very distinctive botanical aspect when compared with other parts of Vanua Levu, probably because of different soil constituents. Several well-demarcated and very local endemics, including the present species, come from this vicinity, but unfortunately, due to recent mineral exploitation, they may continue to be known only from existing herbarium material.

15. *Astronidium pallidiflorum* A. C. Sm. in Contr. U. S. Nat. Herb. 37:80. 1967; J. W. Parham, Pl. Fiji Isl. ed. 2. 208. 1972. FIGURE 78D.

A tree about 15 m. high, collected in dense forest at an elevation of 50–150 m. The flowers, obtained in November, have the petals, stamens, and style pale greenish white.

TYPIFICATION: The type is *Smith 9313* (US 2191790 HOLOTYPE; ISOTYPES at BISH, GH, K), collected Nov. 26, 1953, in hills west of Waivunu Creek, between Ngaloa and Korovou, Serua Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and known only from the type collection.

7. MEMECYLON L. Sp. Pl. 349. 1753; Seem. Fl. Vit. 84. 1866; Cogn. in DC. Monogr. Phan. 7: 1130. 1891; Bakh. f. in Meded. Bot. Mus. Herb. Rijks Univ. Utrecht 91: 333. 1943.

Glabrous trees or shrubs, the leaf blades coriaceous, entire, with an obvious costa and 2 obscure marginal nerves, inconspicuously penninerved, the cross-venation obscure; inflorescences axillary or on defoliate branchlets or rarely terminal, usually fasciculate or cymose, comparatively few-flowered, the flowers 4-merous, usually ♂; hypanthium campanulate or cupuliform, the calyx limb short, truncate or dentate, persistent; petals ovate or orbicular; stamens 8, equal, the filaments filiform, inflexed, the anthers short, dolabriform, dehiscing by lateral clefts, the connective thick, dorsally appendaged, not produced at base; ovary inferior, 1-locular, with a free central placenta, the ovules 2–12 or more, the style filiform or narrowly conical; fruit a subglobose berry, the seeds 1 or 2, large, ascending, usually globose, with a brittle, shining testa.

TYPE SPECIES: *Memecylon capitellatum* L., the only original species.

DISTRIBUTION: Africa and Asia through Malaysia to Australia and eastward to Fiji and Tonga; there are more than 300 species. Two species are known to occur in Fiji, one of them endemic.

KEY TO SPECIES

- Branchlets terete, sometimes obscurely angled in distal internodes; petioles obvious, 3–10 mm. long; leaf blades elliptic to elliptic-lanceolate, infrequently obovate, 3.5–15 × 1–7 cm., acute to attenuate at base, the secondary nerves (apparent only in young leaves) 5–10 per side. 1. *M. vitiense*
- Branchlets in distal internodes conspicuously 4-angled or 4-winged; petioles negligible, 1–1.5 mm. long; leaf blades narrowly oblong-lanceolate, 10–14 × 2–3 cm., rounded at base, the secondary nerves (apparent only in young leaves) up to 30 per side. 2. *M. insperatum*

FIGURE 78. A & B, *Astronidium storckii*; A, indument on venation of lower leaf blade surface, × 30; B, portion of young inflorescence, showing copiously pilose bracts and young flower buds, × 6. C, *Astronidium kasiense*; indument on venation of lower leaf blade surface, × 30. D, *Astronidium pallidiflorum*; indument on venation of lower leaf blade surface, × 30. E, *Memecylon vitiense*; distal portion of branchlet, with foliage and inflorescences, × 1/3. A from DA 7496, B from Smith 4918, C from Smith 1799, D from Smith 9313, E from Smith 128.

1. *Memecylon vitiense* A. Gray, Bot. U. S. Expl. Exped. 1: 573. 1854; Seem. in Bonplandia 9: 256. 1861, Viti, 436. 1862, Fl. Vit. 84. 1866; Triana in Trans. Linn. Soc. 28: 159. 1871; Drake, Ill. Fl. Ins. Mar. Pac. 173. 1890; Cogn. in DC. Monogr. Phan. 7: 1158. 1891; J. W. Parham, Pl. Fiji Isl. 149. 1964, ed. 2. 213. 1972.

FIGURE 78E.

Memecylon vitiense var. β A. Gray, Bot. U. S. Expl. Exped. 1: 573. 1854, in Proc. Amer. Acad. Arts 5: 317. 1862, in Bonplandia 10: 35. 1862; Seem. Fl. Vit. 85. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 173. 1890. *Memecylon harveyi* Seem. Fl. Vit. 85. 1866; Triana in Trans. Linn. Soc. 28: 159. 1871; Cogn. in DC. Monogr. Phan. 7: 1154. 1891; Yuncker in Bishop Mus. Bull. 220: 206. 1959.

A shrub or tree 1-15 m. high, often slender or freely branched, occurring from near sea level to an elevation of 1,075 m. in various types of forest (dense, dry, light, or secondary) or in thickets on crests and ridges. The petals and filaments are white or faintly purple-tinged, the anthers are yellow, the style is white, and the fruits become black at maturity. Flowers and fruits may be seen throughout the year.

TIPIFICATION AND NOMENCLATURE: The type is *U. S. Expl. Exped.* (US 62367 HOLOTYPE; putative ISOTYPE at K), collected in 1840 in Mathuata (Vanua Levu) and Ovalau (according to Gray, although no locality data are indicated on the two mentioned specimens). Gray's var. β is based on *U. S. Expl. Exped.* (US 62366), with obovate, obtusely cuspidate leaf blades; perhaps one or the other locality refers to this, but it cannot be said which. The type of *Memecylon harveyi* is *Harvey* (K HOLOTYPE), obtained from "Vava'u and Lifuka," Tonga, in August or October, 1855. It has been customary to refer Tongan material of this affinity to *M. harveyi*, but the type and other Tongan collections seem to me indistinguishable from Fijian material.

DISTRIBUTION: New Hebrides, Fiji, and Tonga. *Kajewski 509* and *671*, from the New Hebrides, seem correctly referred here. In Fiji the species is locally abundant and widespread; I have examined more than 50 collections.

LOCAL NAMES AND USES: This well-known species in Fiji passes as *raumbalambu*, *kaukata*, *manda*, *vuna*, *rawavuna*, and *katasai*. Its wood is heavy, hard, and durable, being used for spears, walking sticks, and sometimes for canoes. A medicinal use reported in the Yasawas suggests that the plant is used for treating neck swellings, but details are vague.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Near Mbatinaremba, Naruarua Gulch, *St. John 1804*. VITI LEVU: MBA: Mt. Koromba, *Smith 4668*; vicinity of Nandarivatu, *DA 12387*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 13302*. SERUA: Hills between Ngaloa and Wainiyambia, *Smith 9388*. REWA: Mt. Korombamba, *Gillespie 2346*. KANDAVU: *DA 12440 (DF 85, Watkins 748)*; hills above Namalata and Ngaloa Bays, *Smith 128*. OVALAU: Hills southeast of Mbureta River, *Smith 7424*. VANUA LEVU: MBUA: Lower Wainunu River valley, *Smith 1743*. MATHUATA: Nanduri, *Tohill 447*; Wainikoro River, *Greenwood 711*. THAKAUNDROVE: Hills between Vatukawa and Wainigio Rivers, Ndrekeniwai valley, *Smith 596*; Koroivono, Natewa Bay, *Seemann 172*; west of Korotasere, Natewa Bay, *Smith 1929*; west of Mbutha Bay, Natewa Peninsula, *Smith 806*. KAMBARA: On limestone, *Smith 1275*. FULANGA: On limestone, *Smith 1158*.

Although flowers and fruits are very consistent, there are foliage differences within *Memecylon vitiense*, but I doubt if any forms are worthy of nomenclatural recognition. The holotype (like that of *M. harveyi*) seems biologically "average," with leaf blades moderately small, elliptic-lanceolate, and acute or bluntly cuspidate at apex (cf. FIGURE 78E). Many specimens have leaf blades larger than this and a few (e. g. *Smith 4668*) somewhat smaller ones; the leaf blades are unusually long and narrow in *Greenwood 711* and *Smith 596*, and they are comparatively broad, obovate, and very

FIGURE 79. *Memecylon insperatum*, from *DA 17098*; A, distal portion of branchlet, with foliage and inflorescences, $\times 1/3$; B, inflorescence, $\times 6$; C, flower with petals removed, showing style (s), anther (a), and filament (f), $\times 20$; D, stamen, $\times 50$.



bluntly cuspidate in the holotype of Gray's var. β , with which *Smith 806* and *9388* agree. The leaf blades of *Smith 1929* are small, obovate, and rounded to retuse at apex; this is one of the most extreme specimens, but the gradation in the available material seems to preclude infraspecific division.

2. *Memecylon insperatum* A. C. Sm. in Pacific Sci. 25: 498. 1971. FIGURE 79.

A shrub 1.8–2.5 m. high, found in forest at an elevation of about 100 m., in October bearing flowers with white petals and mature fruits that are blue to black.

TYPIFICATION: The type is *DA 17098* (coll. *D. Koroiveibau* & *D. Anderson*) (BISH HOLOTYPE; ISOTYPES at CHR, K, SUVA), collected Oct. 25, 1969, near Nambua Village, on road to Tambia Creek, west of Natewa Bay, Vaturova Tikina, Thakaundrove Province, Vanua Levu. Other isotypes may have been distributed as *Anderson 69-171* (HLA).

DISTRIBUTION: Endemic to Fiji and known only from the type collection.

This recently collected species is so distinct from *Memecylon vitiense* in its angled or winged distal internodes, its subsessile leaves, and its very narrow leaf blades with rounded bases and numerous secondary nerves that one must assume it to have evolved from a different, presumably Malesian, immigrant ancestor.

FAMILY 132. COMBRETACEAE

COMBRETACEAE R. Br. Prodr. Fl. Nov. Holl. 351. 1810.

Trees or shrubs, sometimes scandent or twining, estipulate (stipules rarely vestigial), usually with characteristic compartmented hairs; leaves alternate or opposite, rarely verticillate, petiolate (rarely sessile), simple, the blades pinnate-nerved, often with domatia, entire; inflorescences terminal and axillary, spicate, racemose, or paniculate; flowers \varnothing or sometimes σ (with sterile and sometimes pedicel-like ovary), actinomorphic or seldom slightly zygomorphic, sometimes sessile, epigynous (in our genera but in one genus semi-epigynous); hypanthium slightly to conspicuously prolonged beyond ovary into a calyx tube, sometimes differentiated into a lower part ("lower receptacle") containing ovary and epigynous disk and an expanded upper part (calyx limb or "upper receptacle"), the lobes 4 or 5 (–8), valvate, less often imbricate; petals 4 or 5, inserted near mouth of calyx tube, alternating with calyx lobes, imbricate or valvate, often lacking; stamens usually twice as many as calyx lobes and biseriate, inserted within calyx tube, those of the upper (antepetalous) cycle sometimes reduced or lacking, the filaments inflexed in bud, often becoming long-exserted, the anthers dorsifixed, usually versatile, dehiscent by lengthwise slits; disk intrastaminal, sometimes lacking; ovary inferior (in our genera but in one genus semi-inferior), unilocular, often with longitudinal costae as many as calyx lobes, the ovules usually 2 (–6), pendulous on a slender funicle from apex of locule, anatropous, the style usually elongate, free (except in *Quisqualis*), the stigma usually punctate; fruit a 1-seeded pseudocarp, drupelike or dry, usually indehiscent, often costate or winged, sessile or stipitate, the pericarp papyraceous to leathery or carnos, the seeds without endosperm, the cotyledons often convolute, sometimes plicate or contorted.

DISTRIBUTION: Pantropical and subtropical, with 18–20 genera and 450–600 species. Four genera are recorded in Fiji, two with indigenous species and two known only in cultivation.

USEFUL TREATMENTS OF FAMILY: EXELL, A. W. Combretaceae. Fl. Males. I. 4: 531–589. 1954. EXELL, A. W., & C. A. STACE. Revision of the Combretaceae. Bol. Soc. Brot. II. 40: 5–25. 1966. COODE, M. J. E. Combretaceae. Manual For. Trees Papua New Guinea 1 (rev.): 1–86. 1969. BYRNES, N. B. A revision of Combretaceae in Australia. Contr. Queensland Herb. 20: 1–72. 1977. COODE, M. J. E. Combretaceae. In: Womersley, J. S. Handb. Fl. Papua New Guinea 1: 43–110. 1978. VLIET, G. J. C. M. VAN. Wood anatomy of the Combretaceae. Blumea 25: 141–223. 1979.

KEY TO GENERA

Lower receptacle (hypanthium: portion of calyx tube including ovary and disk) without adnate bracteoles (tribe Combretaceae).

Flowers all ♀ (in our species); petals present (in our species); fruits usually terete or 4- or 5-winged or -ridged, with scarcely or non-lignified pericarp; leaves usually opposite or verticillate, without petiolar glands, the blades with scales or stalked glands; our species cultivated only; sometimes climbing or scrambling plants (subtribe Combretinae).

Style not adnate to calyx tube (or extremely shortly so); stamens exserted; hypanthium and calyx tube short; leaves with scales or stalked glands. 1. *Combretum*

Style adnate to one inner face of calyx tube for about half the length of the latter; stamens not exserted; hypanthium and calyx tube conspicuously elongated, more than 5 cm. long in our species; leaves with stalked glands. 2. *Quisqualis*

Flowers andromonoecious (♀ and ♂); petals absent; fruits terete or flattened, often 2-5-winged or -ridged, with the pericarp often lignified; leaves spiral or alternate, often with petiolar glands, without scales or stalked glands; indigenous or cultivated species, trees or shrubs (subtribe Terminaliinae).

3. *Terminalia*

Lower receptacle (hypanthium) with 2 adnate bracteoles; our species an indigenous tree or shrub, occurring only near sea level in mangrove swamps, strand thickets, or littoral forest (tribe Lagunculariaceae).

4. *Lumnitzera*

1. **COMBRETUM** Loefl. Iter Hispan. Append. 308. 1758; M. Lawson in Oliver, Fl. Trop. Afr. 2: 419. 1871; Exell in Fl. Males. I. 4: 535. 1954; Exell & Stace in Bol. Soc. Brot. II. 40: 18. 1966; Coode in Manual For. Trees Papua New Guinea 1 (rev.): 82. 1969, in Handb. Fl. Papua New Guinea 1: 43. 1978. Nom. cons.

Trees, shrubs, or woody climbers or scramblers; leaves opposite or verticillate, rarely alternate, the petioles eglandular, sometimes persisting as thorns after fall of leaves, the blades with scales or stalked glands (rarely both) and domatia; flowers 4- or 5-merous, sessile; hypanthium and calyx tube short; petals small and inconspicuous to showy, rarely absent; stamens exserted; disk usually present, sometimes small or absent; ovules 2-6; style free (rarely very shortly adnate to calyx tube), usually exserted, rarely short; fruit with 4 or 5 wings, ridges, or angles.

TYPE SPECIES: *Combretum fruticosum* (Loefl.) Stuntz (*Gaura fruticosa* Loefl.) (vide L. Syst. Nat. ed. 10. 999. 1759; Exell in J. Linn. Soc. Bot. 55: 117. 1953).

DISTRIBUTION: Pantropical and subtropical, most abundant in Africa, in the paleotropics extending eastward to New Guinea and New Britain, with about 250 species. One or two species are cultivated in Fiji.

1. ***Combretum constrictum*** (Benth.) M. Lawson in Oliver, Fl. Trop. Afr. 2: 423. 1871; Coode in Manual For. Trees Papua New Guinea 1 (rev.): 82. 1969, in Handb. Fl. Papua New Guinea 1: 45. fig. 13. 1978.

Poivreia constricta Benth. in Hook. Niger Fl. 337. 1849.

As noted in cultivation near sea level in Fiji, *Combretum constrictum* is a shrub or a small, spreading tree to 4 m. high. The petioles are short, with bases forming indurated spines after fall of leaf blades, these being obovate-elliptic, 5-10 × 2-5 cm. The 5-merous flowers, 2-2.5 cm. long, are set all around the axis of dense spikes, not second, with the base of the calyx tube (above hypanthium) inflated. The hypanthium and calyx tube, petals (about 4 mm. long), and filaments are scarlet. Our material was in flower in March.

TYPIFICATION: The type is *Vogelia n.* (K HOLOTYPE), collected "on the Quorra, at Abòh, often growing in the water." The modern locality is Idah, on the Niger River, Nigeria.

DISTRIBUTION: Tropical Africa, and apparently cultivated in a few other tropical areas. Coode (1969, 1978) indicates that it is commonly cultivated in Papua New Guinea. It is probably a recent introduction into Fiji, the only known collection having been made in 1969.

USE: An attractive ornamental.

AVAILABLE COLLECTION: VITI LEVU: REWA: Lami, in private garden, DA 16467.

A second species of *Combretum* that may be anticipated in Fijian gardens is *C. grandiflorum* G. Don (in Edinburgh Philos. J. 11: 346. 1824). Although no Fijian specimens are at hand, this was listed in Thurston's 1886 *Catalogue*. It is a West African species typified by *G. Don* (BM HOLOTYPE?; ISOTYPES at CGE, K, OXF), collected in Sierra Leone without precise locality. It is a striking species, well known in gardens of Java, Hawaii, and perhaps elsewhere in the Pacific, readily distinguished from *C. constrictum* by its climbing habit, larger leaf blades (up to 20 × 10 cm.), and second and larger flowers up to 5 cm. long and with scarlet petals about 15 mm. long. M. J. E. Coode has kindly provided me with data about the two species of *Combretum* here mentioned.

2. *QUISQUALIS* L. Sp. Pl. ed. 2. 556. 1762; Exell in J. Bot. 69: 117. 1931, in Fl. Males. I. 4: 544. 1954; Exell & Stace in Bol. Soc. Brot. II. 38: 139. 1964, in op. cit. 40: 18. 1966; Coode in Manual For. Trees Papua New Guinea 1 (rev.): 84. 1969; Byrnes in Contr. Queensland Herb. 20: 63. 1977; Coode in Handb. Fl. Papua New Guinea 1: 51. 1978.

Woody, climbing plants; leaves opposite or subopposite, the petioles partially persistent on old branchlets, their bases forming thorns; inflorescences terminal or axillary, spicate, elongate, bracteate, the flowers ♂, actinomorphic or slightly zygomorphic, 5-merous; hypanthium pilose or subglabrate, the calyx limb tubular, often narrowly so, the lobes deltoid, sometimes with filiform tips; petals larger than calyx lobes and enlarging during anthesis, horizontally spreading; stamens 10, biseriate, inserted within calyx limb near its mouth, the anthers versatile, not exerted; disk narrowly tubular or lacking; ovules 2-4, the funicles sometimes papillose; style adnate to one inner face of calyx tube for about half the length of the latter or (as in our species) for more than half the length; fruits dry, oblong, narrowed at both ends, with 5 longitudinal wings, deeply sulcate between wings, the seed longitudinally sulcate.

TYPE SPECIES: *Quisqualis indica* L., the only original species.

DISTRIBUTION: Africa and Asia, with about 17 species, one of which extends eastward to Papuaia and is widely cultivated elsewhere, as in Fiji.

USEFUL TREATMENT OF GENUS: EXELL, A. W., & C. A. STACE. A reorganization of the genus *Quisqualis* (*Combretaceae*). Bol. Soc. Brot. II. 38: 139-143. 1964.

1. *Quisqualis indica* L. Sp. Pl. ed. 2. 556. 1762; Merr. Interpret. Rumph. Herb. Amb. 390. 1917; Exell in J. Bot. 69: 124. 1931; Yuncker in Bishop Mus. Bull. 178: 89. 1943; Exell in Fl. Males. I. 4: 547. fig. 8. 9. 1954; Yuncker in Bishop Mus. Bull. 220: 200. 1959; J. W. Parham, Pl. Fiji Isl. 145. 1964, ed. 2. 206. 1972; Coode in Manual For. Trees Papua New Guinea 1 (rev.): 84. fig. 32. 1969; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 60. 1970; Byrnes in Contr. Queensland Herb. 20: 64. 1977; Coode in Handb. Fl. Papua New Guinea 1: 51. fig. 16. 1978.

A climbing vine or liana, cultivated at elevations up to about 200 m., with ovate-elliptic leaf blades as large as 18 × 9 cm. The fragrant flowers have the calyx tube green, slender, and 5-8 cm. long; the petals, up to 20 × 9 mm., are white to pale pink, finally turning deep red; the filaments are pale green, becoming red distally, and the style is green; fruits have not been noted in Fiji. Flowers have been obtained between November and March.

TYPIFICATION: Exell (1931, cited above) indicated a specimen from Hortus Clifortianus (LINN) as the holotype; it is one of two specimens preserved in the herbarium

of the Linnean Society. Nevertheless, Linnaeus in 1762 did not refer to those specimens, mentioning only "Rumph. amb. 5. p. 71. t. 38." Therefore I believe the logical holotype to be *Quis qualis* Rumph. Herb. Amb. 5: 71. t. 38. 1747, as suggested by Merrill (1917, cited above).

DISTRIBUTION: Paleotropical, extending eastward to New Guinea and New Britain, and now widely cultivated throughout tropical areas.

LOCAL NAME AND USE: The *Rangoon creeper* is a striking ornamental, more frequently cultivated in Fiji than suggested by the few specimens at hand. It may have been first introduced by J. B. Thurston, being listed in his 1886 *Catalogue. DA 16209* is from Thurston's garden "Thornbury."

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Suva Botanical Gardens, *DA 12327*; Suva, in private garden, *DA 16209*. VANUA LEVU: MATHUATA: Natua Village, Seanggangga Plateau, *Smith 6875*.

3. **TERMINALIA** L. Syst. Nat. ed. 12. 674 (err. 638). 1767, Mant. Pl. 128. 1767; Seem. Fl. Vit. 92. 1866; Exell in Fl. Males. I. 4: 548. 1954; Exell & Stace in Bol. Soc. Brot. II. 40: 21. 1966; Coode in Manual For. Trees Papua New Guinea 1 (rev.): 5. 1969; A. C. Sm. in Brittonia 23: 394. 1971; Byrnes in Contr. Queensland Herb. 20: 4. 1977; Coode in Handb. Fl. Papua New Guinea I: 51. 1978. Nom. cons.

Shrubs or trees, often with characteristic "pagoda" type branching, often deciduous for a brief period, frequently buttressed or with stilt-roots; leaves spirally arranged (rarely alternate or subopposite), often crowded at ends of branchlets, frequently with 2 or more glands on petioles or near bases of blades, the blades often with domatia; inflorescences axillary, less often terminal, spicate or less often paniculate, usually with ♀ flowers toward base and ♂ flowers toward apex, the flowers 5-merous (rarely 4-merous), actinomorphic, sessile (♂ flowers sometimes with narrowed hypanthia simulating pedicels); hypanthium glabrous or pilose, the lower part ("lower receptacle") adnate to ovary, the calyx limb ("upper receptacle") campanulate, often small, the lobes deltoid to ovate; petals lacking; stamens usually 10, exerted, the anthers dorsifixed, versatile; disk intrastaminal, usually densely pilose; ovary with 2 (rarely 3 or 4) pendulous ovules, the style free, exerted (sometimes lacking in ♂ flowers); fruits indehiscent, sessile, very variable in size and shape, often drupelike with 2-5 (-7) wings and fleshy mesocarp, or dry and leathery with 2 or more lateral wings, the seed contained within a hard endocarp.

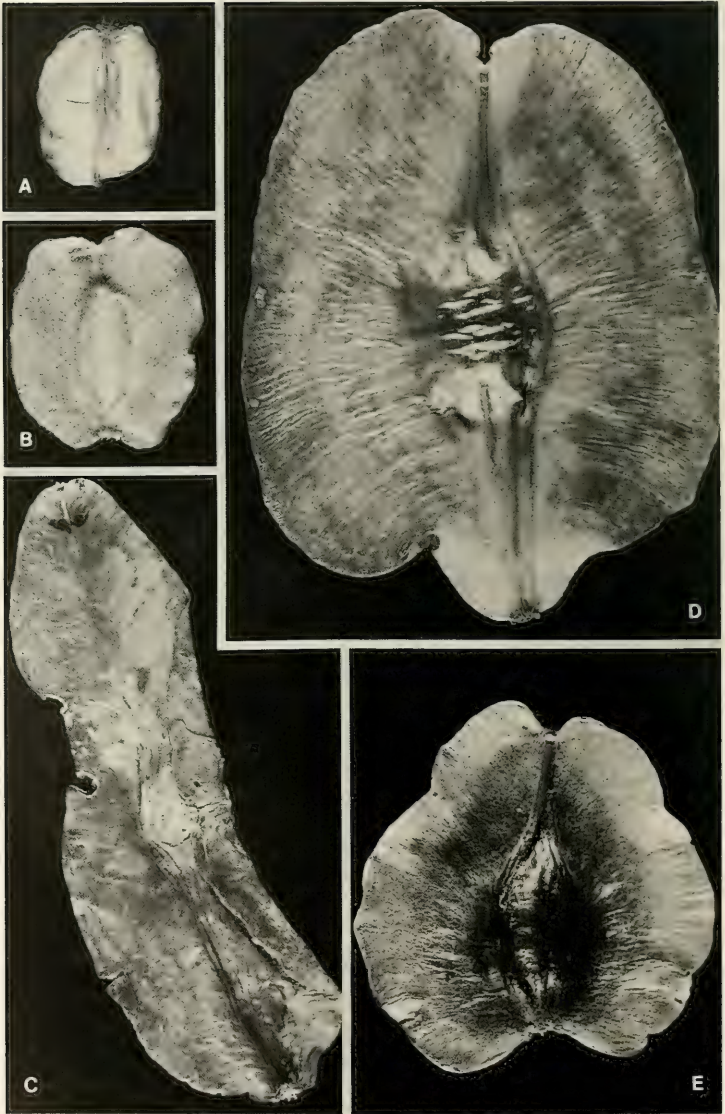
TYPE SPECIES: *Terminalia catappa* L., the only original species.

DISTRIBUTION: Tropical and subtropical, with 200-250 species. Fourteen species are here recorded from Fiji, ten indigenous (including one newly described) and four only in cultivation.

USEFUL TREATMENTS OF GENUS: SMITH, A. C. Studies of Pacific Island plants, XXIV. The genus *Terminalia* (Combretaceae) in Fiji, Samoa, and Tonga. Brittonia 23: 394-412. 1971. COODE, M. J. E. Notes on *Terminalia* L. (Combretaceae) in Papuaia. Contr. Herb. Austral. 2: 1-33. 1973. FOSBERG, F. R., & M.-H. SACHET. *Terminalia* L. (Combretaceae) in eastern Polynesia. Smithsonian Contr. Bot. 47: 13-17. 1981.

Of the species known only in cultivation in Fiji, *Terminalia arjuna*, *T. brassii*, and *T. bellirica* are Indo-Malesian and represent relationships not indigenously present in Fiji. The fourth cultivated species, *T. richii*, is indigenous in Samoa and Niue; its relationships are with species represented in Papuaia but not yet known in the New Hebrides or Fiji.

Of the ten indigenous Fijian species, eight (the endemic species here numbered 3-10) belong in Exell's (1954) Series C, which does not extend eastward of Fiji. The two remaining species (those here numbered 13 and 14) fall into Exell's (1954) Series D and E; these species are primarily littoral and are not endemic to Fiji.



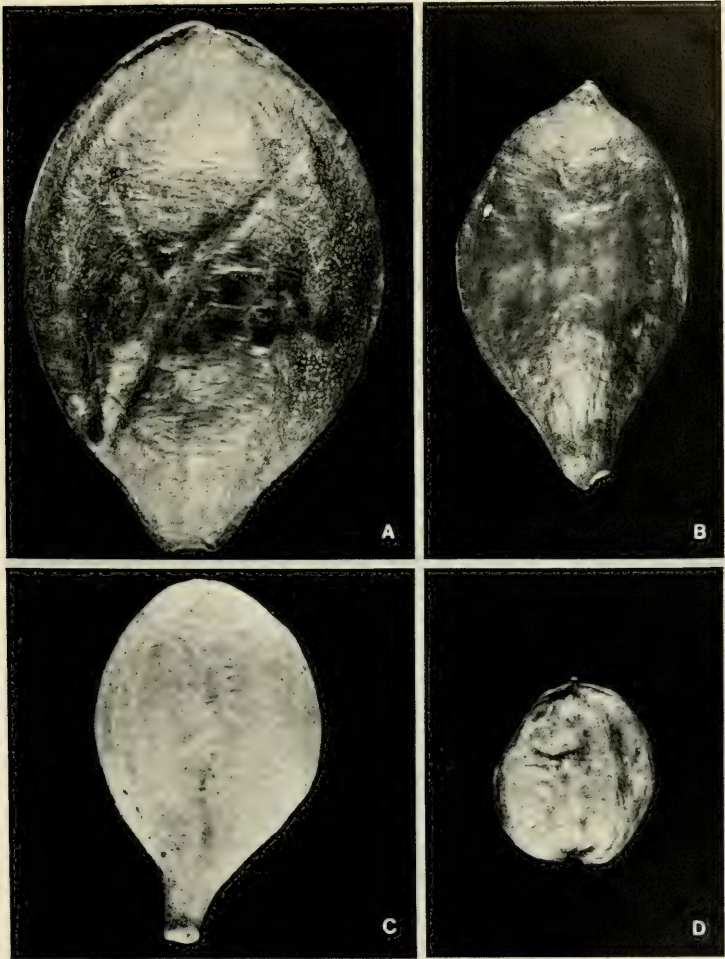


FIGURE 81. *Terminalia* fruits, all $\times 2$; A, *T. catappa*, from Smith 998; B, *T. litoralis* var. *litoralis*, from Bryan 280; C, *T. bellirica*, from Forest Dept. Sandakan 48561, from Sabah; D, *T. richii*, from Whistler 1521, from Upolu, Samoa.

FIGURE 80. *Terminalia* fruits, all $\times 2$; A, *T. brassii*, from Streimann (NGF 21825), cultivated in Lae Botanic Garden, Papua New Guinea; B, *T. luteola*, from DA 14627; C, *T. pterocarpa*, from DF 596; D, *T. capitanea*, from DA 17355; E, *T. crebrifolia*, from Berry 34.

KEY TO SPECIES

Fruits with obvious wings, these sometimes as broad as or broader than fruit-body.

Wings of fruit 5-7, essentially equal, hard, coriaceous, 6-12 mm. broad, not as broad as fruit-body; leaves usually subopposite, the blades oblong or elliptic, 8-20 × 2-8 cm., rounded or retuse to subacute at apex; inflorescences usually paniculate; cultivated only. 1. *T. arjuna*

Wings of fruit 2 (sometimes 3 or 5, but the subsidiary wings rudimentary and much narrower than the 2 primary wings), thin, submembranous or papyraceous, as broad as or broader than fruit-body.

Leaves alternate or subopposite, not congested, the blades oblong to elliptic, usually 7-18 × 3-6 cm., gradually narrowed to an acute apex; inflorescences paniculate; fruits suborbicular to elliptic, 9-14 × 5-11 mm., with 2 well-developed wings and 3 inconspicuous, subsidiary flanges or crests; cultivated only. 2. *T. brassii*

Leaves spirally arranged, distal and often congested on branchlets; inflorescences spicate; fruits circinalate, the wings 2, rarely with a third inconspicuous, subsidiary wing; indigenous (and endemic) species of forested areas, not littoral.

Plants comparatively slender, the branchlets 1.5-8 mm. in diameter toward apex, the leaf blades chartaceous to subcoriaceous, usually 4-13 × 1.2-8 cm.; flowers comparatively small, the calyx limb 4-8 mm. in diameter including lobes.

Leaf blades very early glabrate on both surfaces; inflorescence rachis glabrous or sparsely pilose with hairs to 0.3 mm. long, the indument not persisting in fruit, the bracts (except for the lowermost subfoliaceous ones) small, 1-2.5 mm. long at anthesis; fruits (as far as known) elliptic or oblong-elliptic, 4-5.5 × 1.5-3 cm., soon glabrate.

Lower receptacle of calyx glabrous or sparsely strigillose, the calyx limb infundibular or narrowly campanulate, 3-5 mm. long, 4-6 mm. in diameter including lobes, these deltoid or deltoid-lanceolate, 1.5-3 mm. long, the filaments 7-15 mm. long at anthesis; petioles 0.8-2 cm. long, the leaf blades elliptic to oblanceolate-elliptic, 4-11 × 1.2-5.5 cm.

Indument of young parts not persisting on branchlets, foliage, or inflorescences; branchlets slender, 1.5-3 mm. in diameter toward apex; domatia lacking or very infrequent, then inconspicuous and oval, without associated hairs; inflorescences 6-16 cm. long; anthers 0.8-1 mm. long; apparently endemic to southern Viti Levu. 3. *T. vitiensis*

Indument of young parts persisting to anthesis on branchlets, petioles, leaf blades beneath, inflorescence peduncle, rachis, and lower receptacle; branchlets 2-4 mm. in diameter toward apex; domatia often present, the orifice round or broadly oval, with marginal hairs 0.2-0.3 mm. long; inflorescences 4-9 cm. long; anthers 0.6-0.8 mm. long; apparently endemic to Vanua Levu. 4. *T. simulans*

Lower receptacle of calyx copiously sericeous, the calyx limb shallowly cupuliform, 1-2 mm. long, becoming rotate and 4-5 mm. in diameter including lobes, these broadly deltoid, 1-1.5 mm. long, the filaments 3-5 mm. long at anthesis, the anthers 0.5-0.7 mm. long; petioles (1-) 1.5-3 cm. long, the leaf blades obovate to elliptic, usually 7-13 × 4-8 cm.; domatia prominent, without associated hairs; inflorescences at anthesis 8-14 cm. long; apparently endemic to southern Viti Levu. 5. *T. pterocarpa*

Leaf blades spreading-pilose or strigillose beneath, tardily glabrate; domatia frequent, with associated hairs; inflorescence rachis copiously tomentellous or sericeous with hairs 0.2-0.6 mm. long, these long-persistent, the bracts (except for the lowermost subfoliaceous ones) larger, 2.5-7 mm. long at anthesis; fruits (as far as known) orbicular, 1.5-1.8 cm. long and broad, copiously and persistently pilose; apparently endemic to Vanua Levu.

Branchlets 5-8 mm. in diameter toward apex; leaf blades broadly obovate, 4-8 cm. broad, copiously and subsuperficially spreading-pilose beneath, especially on costa and secondaries, with hairs 0.4-1 mm. long; inflorescences with 25-45 flowers, the rachis copiously tomentellous with hairs 0.3-0.6 mm. long, the bracts 2.5-5 mm. long at anthesis, the lower receptacle 2-3.5 mm. long, the filaments 7-9 mm. long. 6. *T. luteola*

Branchlets 4-5 mm. in diameter toward apex; leaf blades obovate to oblanceolate, 2.5-6 cm. broad, strigillose beneath with strictly appressed hairs 0.2-0.3 mm. long, eventually glabrate; inflorescences with 30-60 flowers, the rachis sericeous with hairs 0.2-0.4 mm. long, the bracts 5-7 mm. long at anthesis, the lower receptacle 4-5 mm. long, the filaments 10-13 mm. long. 7. *T. strigillosa*

Plants robust, the branchlets 8-18 mm. in diameter toward apex, the leaf blades thick, coriaceous at maturity, usually 14-30 × 5-11 cm.; flowers larger, the calyx limb subcarinose, at anthesis 8-14 mm. in diameter including lobes.

Fruits glabrous; flowers glabrous or with the lower receptacle closely sericeous (hairs not exceeding 0.3 mm. in length and not persisting in fruit); inflorescence with the peduncle and rachis glabrous or very sparsely appressed-hirtellous (hairs not persisting in infructescence).

- Petioles 5–10 (–20 in some juvenile leaves) mm. long, winged nearly to base, with inconspicuous linear marginal glands; leaf blades when very young strigose or sericeous but soon glabrate, with conspicuous, copiously tomentellous domatia, the secondary nerves subspreading, curved; inflorescences to 30 cm. long at anthesis, the peduncle and rachis sparsely appressed-hirtellous, the bracts 7–8 mm. long and copiously sericeous on both sides; flowers with the lower receptacle closely sericeous; infructescences to 30 cm. long; fruits oblong- or ovate-elliptic, 4–6.5 × 2–6 cm., obtuse or cuneate or rounded at base, shallowly retuse at apex, circumalate, the basal wing 1–2.7 cm. broad; branchlets 8–13 mm. in diameter toward apex; presumably endemic to Viti Levu. 8. *T. capitanea*
- Petioles 17–25 mm. long, with conspicuous, raised, oval, marginal glands near apex; leaf blades completely glabrous from earliest stages, without domatia, the secondary nerves ascending at an angle of about 45° and only slightly curved; inflorescences (young) 7–9 cm. long, the peduncle, rachis, bracts (about 2 mm. long), and flowers (except for disk) strictly glabrous; branchlets 10–12 mm. in diameter toward apex; presumably endemic to Vanua Levu. 9. *T. psilantha*
- Fruits subsersistently tomentellous, orbicular or broadly ovate, 2.5–3.3 cm. long and broad, cordate at base, retuse at apex, circumalate except at base, the fruit-body there essentially sessile on rachis; flowers with the lower receptacle and calyx limb copiously sericeous-villose (hairs often subspreading and 0.3–1 mm. long, those of the limb finally lost but those of the lower receptacle persisting in mature fruit); inflorescences 10–15 cm. long, the peduncle and rachis copiously and subsersistently sericeous-villose; leaf blades without domatia or these very infrequent and inconspicuous; branchlets 10–18 mm. in diameter toward apex; presumably endemic to Vanua Levu. 10. *T. crebrifolia*
- Fruits laterally compressed or not, narrowly winged or not, the wings if present much less conspicuous than fruit-body; inflorescences spicate.
- Fruits densely and finely velutinous or sericeous, not laterally compressed, ellipsoid to obovoid, 2–3.3 × 1.8–2.2 cm., abruptly narrowed proximally, usually drying with 5 well-marked longitudinal ridges; leaves spirally arranged, the petioles conspicuous, 3–9 cm. long, the blades usually broadly elliptic, 7–18 × 6–11 cm., and rounded to obtuse at apex; cultivated only. 11. *T. bellirica*
- Fruits laterally compressed, glabrous or essentially so; petioles not exceeding 3 cm. in length.
- Leaf blades lanceolate to lanceolate-elliptic, usually 6–13 × 2–5 cm., attenuate at base, with 8–12 subsending secondary nerves per side, the petioles slender, 1–3 cm. long; fruits up to 1.8 × 1.5 cm., unwinged but with conspicuous lateral ridges, with a faint sericeous indument but becoming essentially glabrate; cultivated only. 12. *T. richii*
- Leaf blades obovate or broadly obovate-elliptic, usually 7–27 × 5–18 cm., subcordate to obtuse at base, with 6–12 spreading secondary nerves per side, the petioles 0.5–2 cm. long; fruits more than 2 cm. in length; indigenous, littoral or sublittoral species.
- Fruits usually 3.5–6 × 2.5–4 × 2–3 cm., alate at least in upper part with a stiff, rigid wing 2–8 mm. broad; leaf blades large, usually 8–27 × 5–18 cm., usually narrowly subcordate at base, the petioles stout, 0.5–1.5 cm. long. 13. *T. catappa*
- Fruits (in our variety) usually 2.1–3.6 × 1.3–2.1 × 1.2–1.6 cm., without incipient wings; leaf blades smaller, usually 7–20 × 5–15 cm., usually obtuse to rounded or faintly subcordate at base, the petioles often slender, usually 0.6–2 cm. long. 14. *T. littoralis*

1. ***Terminalia arjuna* (Roxb.) Wight & Arn. Prodr. Fl. Ind. Orient. 314. 1834; Brandis, Forest Fl. N. W. India, 224. 1874; C. B. Clarke in Hook. f. Fl. Brit. Ind. 2: 447. 1878; Brandis, Indian Trees, 311. fig. 136. 1906; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 98. 1948, in op. cit. 29: 33. 1959; A. C. Sm. in Brittonia 23: 411. 1971; J. W. Parham, Pl. Fiji Isl. ed. 2. 207. 1972.**

Pentaptera arjuna Roxb. Fl. Ind. ed. 2. 2: 438. 1832.

A sparingly cultivated tree near sea level, up to 25 m. high and with a massive trunk where indigenous.

TYPIFICATION: Roxburgh indicated the species to be a native of various parts of India; the type material was presumably collected by him.

DISTRIBUTION: India and Ceylon, but now cultivated in Malasian gardens and elsewhere at least in the Pacific.

LOCAL NAME AND USES: Known in India as *arjan*, the species has astringent bark which is used medicinally. In cultivation it is considered a desirable shade tree.

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Suva Botanical Gardens, DA 1314, 2545, 2854.

2. *Terminalia brassii* Exell in J. Bot. 73: 134. 1935, in Fl. Males. I. 4: 554. 1954; Coode in Manual For. Trees Papua New Guinea 1 (rev.): 25. fig. 4. 1969; A. C. Sm. in Brittonia 23: 412. 1971; J. W. Parham, Pl. Fiji Isl. ed. 2. 207. 1972; Coode in Contr. Herb. Austral. 2: 5. 1973, in Handb. Fl. Papua New Guinea 1: 65. fig. 18 (4), 25. 1978. FIGURE 80A.

A sparingly cultivated tree, seen only in juvenile condition in Fiji but up to 50 m. high where indigenous.

TYPIFICATION: The type is *Brass 3354* (BM HOLOTYPE; ISOTYPE at BISH), collected Dec. 19, 1932, near Garona, Santa Isabel, Solomon Islands.

DISTRIBUTION: Bismarck Archipelago and the Solomon Islands eastward to San Cristobal, and cultivated at least at Lae, New Guinea, and in Fiji.

USE: The timber is considered useful where the species is indigenous, and presumably it was introduced into Fiji as a potential timber tree.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Tholo-i-suva, Kalambo Block 42, DA 16416.

3. *Terminalia vitiensis* A. C. Sm. in Sargentia 1: 74. 1942; J. W. Parham, Pl. Fiji Isl. 145. 1964, ed. 2. 207. 1972; A. C. Sm. in Brittonia 23: 396. 1971. FIGURE 82A & B.

Tree 8–12 m. high, sometimes with a narrow or compact crown, occurring at elevations of 50–100 m. in often dry forest. The calyx and filaments are pale yellow to pale green, the anthers yellow, and the style is greenish. Flowers have been obtained between November and April.

TYPIFICATION: The type is *Degener 15081* (A HOLOTYPE; ISOTYPES at BISH, K, NY, UC, US), collected April 25, 1941, near Mt. Nggamu, east of Ngaloa, Serua Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from a very limited area near the south-central coast of Viti Levu.

AVAILABLE COLLECTIONS: VITI LEVU: SERUA: Hills between Wainiggere and Waisese Creeks, between Ngaloa and Wainiyambia, *Smith 9347, 9526*.

The first three Fijian endemics here treated, *Terminalia vitiensis*, *T. simulans*, and *T. pterocarpa*, are closely related and are readily distinguished from their Fijian relatives *T. luteola* and *T. strigillosa* by having a comparatively short and evanescent vegetative and inflorescence indument, smaller inflorescence bracts, and somewhat smaller flowers. Of the five species mentioned, fruits are known only for *T. pterocarpa* (FIGURE 80C) and *T. luteola* (FIGURE 80B), but these are strikingly different.

4. *Terminalia simulans* A. C. Sm. in Brittonia 23: 397. 1971. FIGURE 82C & D.
Terminalia vitiensis sensu A. C. Sm. in J. Arnold Arb. 33: 100. 1952; non sensu typi.

A tree 5 m. high, apparently rare in thin forest on rocky slopes at an elevation of 350–500 m.; the calyx, filaments, and style are pale yellowish green. The only known collection was flowering in November.

TYPIFICATION: The type is *Smith 6441* (A HOLOTYPE; ISOTYPES at BISH, K, US), obtained Nov. 3, 1947, on the southern slopes of Mt. Numbuiloa, Mathuata Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and known only from the original collection.

5. *Terminalia pterocarpa* Melville & P. Green in Kew Bull. 23: 337. fig. 1, B. 1969; A. C. Sm. in Brittonia 23: 398. 1971; J. W. Parham, Pl. Fiji Isl. ed. 2. 207. 1972; Coode in Contr. Herb. Austral. 2: 3. 1973. FIGURE 80C.

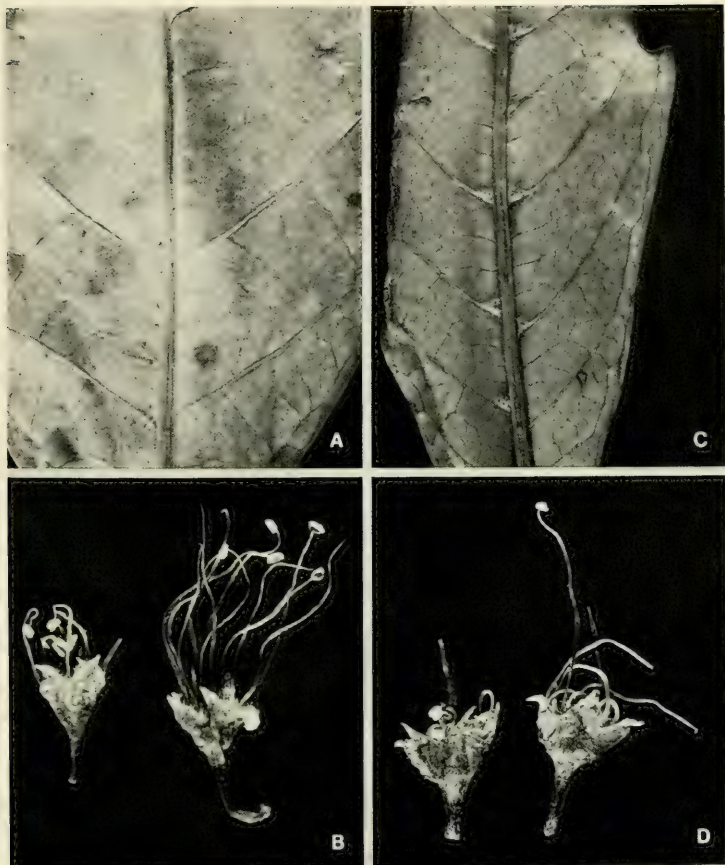


FIGURE 82. A & B, *Terminalia vitiensis*; A, portion of lower surface of leaf blade, lacking domatia, $\times 4$; B, flowers, some anthers fallen, $\times 4$. C & D, *Terminalia simulans*; C, portion of lower surface of leaf blade, showing domatia, $\times 4$; D, flowers, most anthers fallen, $\times 4$. A & B from *Degener 15081*, C & D from *Smith 6441*.

Tree 11–25 m. high, with a trunk to 1 m. in diameter above buttresses, found in sometimes dense forest at elevations of 120–300 m. (once reported at sea level at edge of mangrove belt). The calyx and filaments are white or yellowish, and the fruits are reported as green. Flowers have been noted between December and July, fruits only in March and December insofar as specimens are dated.

TYPIFICATION: The type is *DF 1035B* (κ HOLOTYPE), collected June 24, 1965, near Nathengathenga Creek, along the watershed between the upper Navua River and the

south coast, Serua Province, Viti Levu. Several other collections have been made at the same locality, some of them on the same day, but they bear slightly different altitudinal notations and perhaps were not taken from the same tree as the type.

DISTRIBUTION: Endemic to Fiji and apparently limited to southeastern Viti Levu; I have examined about 30 collections, but it may be suspected that some of these are duplicates bearing either Department of Forestry or individual collectors' numbers.

LOCAL NAME AND USE: *Tivi*; considered a useful timber tree.

REPRESENTATIVE COLLECTIONS: VITI LEVU: SERUA: Near Nathengathenga Creek, tributary of upper Navua River, *DF 416 (Damanu 88)*, 729 (*S1418/3*), 1035 (*S1418/6*), 1035A, 1036 (*S1418/7*), 1204 (*Damanu 227*); inland from Navutulevu, *DF 731 (S1418/2)*, *Damanu N114*; inland from Namboutini, *DF 982 (Damanu 173)*, *DA L.22293 (DF 86, A. Nasoqiri)*; inland from Korovisilou, *DF 732 (S1418/4)*, *Damanu KL5*; inland from Ngaloa, *DF 596 or 820 (S1418/5)*, *DF 1278 (R. Swarup 5)*. NAMOSI: Nambukavesi Creek, *DF 769*. NAITASIRE: Waimanu River, *DA L.13359 (Berry 35)*; Tholo-i-suva Forest Nursery, *DA 6044*. REWA: Lami, at edge of mangrove belt, *Tohill 180*.

In its fruits, *Terminalia pterocarpa* is suggestive of *T. archipelagi* Coode, of the Admiralty Islands and Bismarck Archipelago, but that species has larger fruits and a much more robust habit suggestive of the species numbered 8-10 in the present treatment. A closer ally of *T. pterocarpa* is probably *T. supitiana* Koord., of Celebes, from which it differs in its longer petioles, proportionately broader leaf blades, longer spikes with more numerous flowers, and larger flowers with the lower receptacle copiously sericeous. It may be anticipated, but is by no means certain, that the fruits of *T. vitiensis* and *T. simulans* will suggest those of *T. pterocarpa*, since in other respects these three species seem to form a coherent alliance.

6. *Terminalia luteola* A. C. Sm. in *J. Arnold Arb.* 33: 100. 1952; *J. W. Parham, Pl. Fiji Isl.* 145. 1964, ed. 2. 207. 1972; A. C. Sm. in *Brittonia* 23: 399. 1971.

FIGURES 80B, 83C.

Tree 8-11 m. high, known from elevations of 350-580 m. in forest or in the grassland-forest transitional zone; the filaments and style are yellowish green and the anthers are yellow. Flowers have been obtained in October and fruits in December.

TIPIFICATION: The type is *Smith 6409* (A HOLOTYPE; many ISOTYPES), collected Oct. 29, 1947, on the southern slopes of Mt. Numbuiloa, east of Lambasa, Mathuata Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from the type locality on Vanua Levu. The type of *T. simulans* is from the same locality, but the two species are not very close relatives.

AVAILABLE COLLECTION: VANUA LEVU: MATHUATA: Mt. Numbuiloa (near summit), *DA 14627*.

Terminalia luteola may be most suggestive of *T. whitmorei* Coode, of the Solomon Islands, which it resembles in basic fruit characters. However, *T. whitmorei* has the lower receptacle (ovary) and fruit glabrous rather than copiously and persistently pilose, a slightly larger fruit, shorter petioles, and somewhat larger leaf blades with more numerous secondaries. These two species in vegetative indument differ from the related but essentially glabrous (and larger-fruited) *T. rerei* Coode, of the Solomon Islands, and *T. avicapitis* Coode, of New Guinea. Another relative of *T. luteola*, as suggested by me in 1971, is the Philippine *T. darlingii* Merr., a species with much longer leaf blades, inflorescence bracts, filaments, and styles, but also with the fruit retaining the indument of the lower receptacle of the flower.

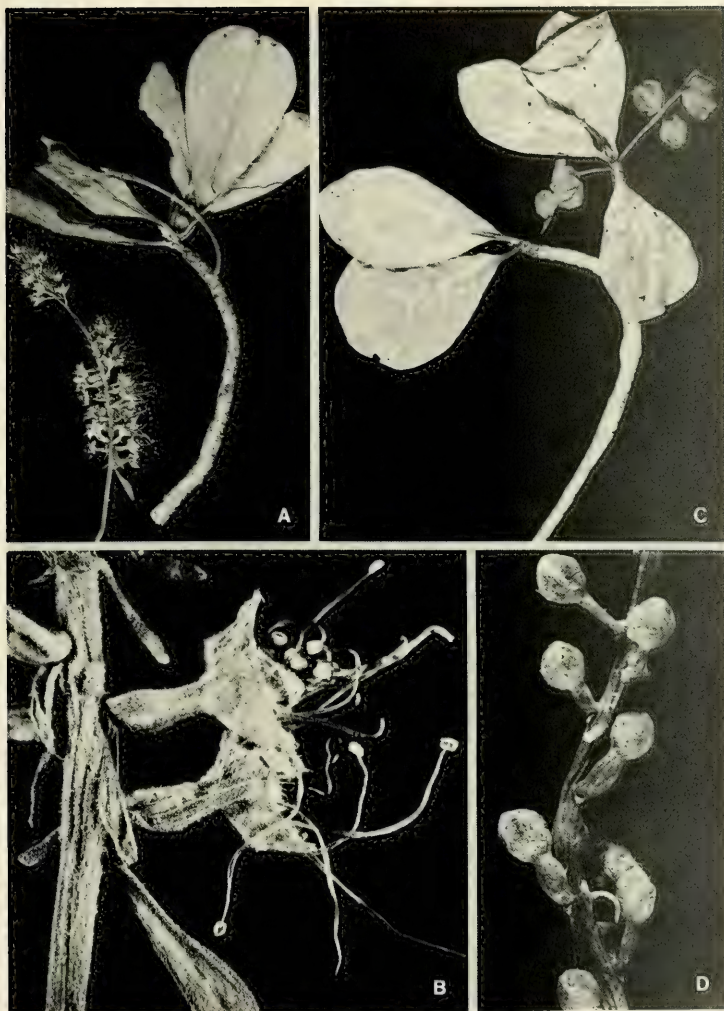


FIGURE 83. A & B, *Terminalia strigillosa*; A, distal portion of branchlet, with foliage, an old attached inflorescence, and a detached inflorescence, $\times 1/2$; B, portion of rachis, with flowers and bracts, $\times 4$. C, *Terminalia luteola*; distal portion of branchlet, with foliage and infructescences, $\times 1/3$. D, *Terminalia psilantha*; portion of rachis with advanced flower buds, showing a subtending bract, $\times 4$. A & B from DF 485. C from DA 14627. D from DF 192.

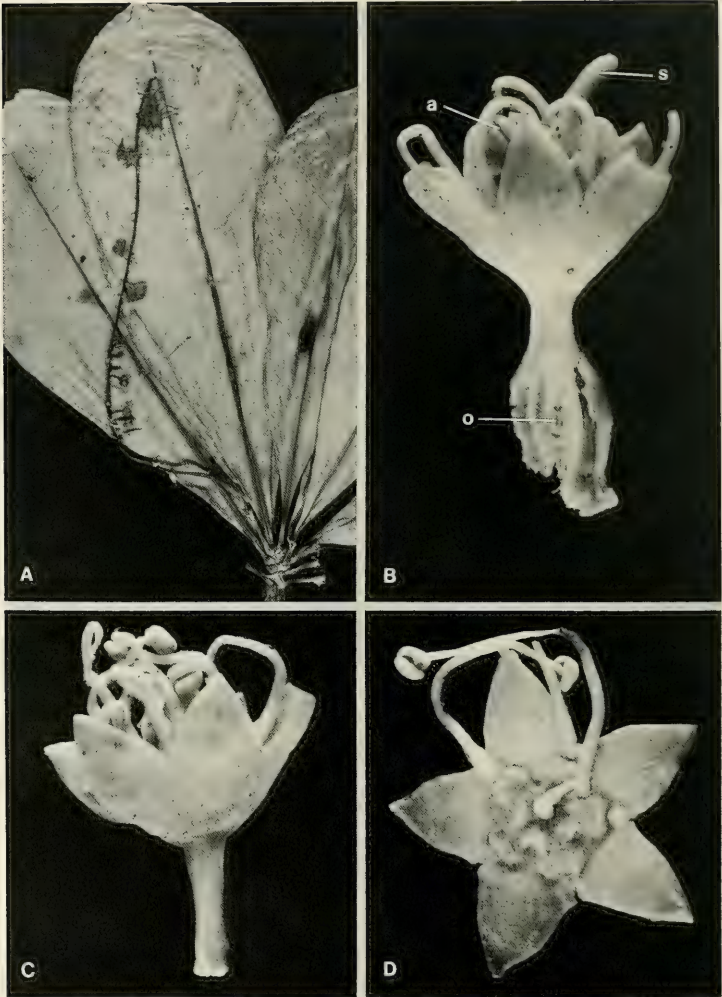


FIGURE 84. *Terminalia capitanea*, from DA 18149; A, distal portion of branchlet with foliage and an attached inflorescence, $\times 1/3$; B, ♀ flower, showing style (s), anther (a), and ovules (o), the ovary wall removed, $\times 4$; C, ♂ flower, $\times 4$; D, distal surface of ♂ flower with spreading calyx lobes, most stamens removed, showing disk and rudimentary style, $\times 4$.

7. *Terminalia strigillosa* A. C. Sm. in Brittonia 23: 400. 1971. FIGURE 83A & B.

A tree 11–20 m. high, with a trunk to 45 cm. in diameter, known from elevations of 60–300 m. in dense or dry forest or in forest patches in open country; the calyx limb, filaments, and style are pale green to light yellow. Flowers have been obtained in September and October but fruits remain unknown.

TIPIFICATION: The type is *DF 485* (A. N. Loweth 2255) (BISH HOLOTYPE; ISOTYPES at K, SUVA), collected Oct. 30, 1962, on the Seanggangga Plateau, Mathuata Province, Vanua Levu. The K isotype, not seen by me in 1971, bears the Loweth number given above and also states: "tropical rain forest of Mt. Ratinitini forests;" I have not located the precise locality.

DISTRIBUTION: Endemic to Fiji and thus far known only from north-central Vanua Levu, probably only in the drainage area of the Ndreketi River.

LOCAL NAMES AND USE: *Tivi* and *losi* have been recorded for this potential timber tree.

AVAILABLE COLLECTIONS: VANUA LEVU: MATHUATA: South of Ndreketi River, in Bull's timber concession area, *Berry 36* (coll. *Damanu*); Sasa Tikina, *Howard 192*; Nambunambuna area, Seanggangga, *Berry 17, 22*.

Terminalia strigillosa seems closely related only to *T. luteola*, from which it differs in dimensions mentioned in the key and in its appressed rather than spreading indument. It is probable that the two species will prove to have somewhat similar fruits.

8. *Terminalia capitanea* A. C. Sm. in Brittonia 23: 401. 1971; Coode in Contr. Herb. Austral. 2: 3. 1973. FIGURES 80D, 84, 85A.

Tree to 26 m. high, often with spreading branches, occurring at elevations of 50–300 m. in often dense forest or in forest on ridges. Flowers have been obtained in January, fruits between March and July.

TIPIFICATION: The type is *DA 17355* (coll. *G. Brownlie, J. W. Parham, D. Koroiweibau, & S. Vodonaivalu*) (BISH HOLOTYPE; ISOTYPES at A, CHR, K, L, MASS, NY, SUVA, US), a fruiting collection obtained July 6, 1970, on the slopes of Mt. Korombamba, Rewa Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from southeastern Viti Levu.

LOCAL NAME AND USE: This timber tree is known in the Waimanu River area as *tiviloa*.

AVAILABLE COLLECTIONS: VITI LEVU: NAMOSI: Hills east of Navua River, *Greenwood 1011*. NAITASIRE: Vicinity of Vatuvula Village, Waimanu River, *DA 15689* (coll. *Berry*), *Berry 71*. REWA: Slopes of Mt. Korombamba, *Gillespie 2368, Meebold 17024* (fr. only, excl. fol.), *DA 1232, 5672, 16546, 17274, 17292, 18149*.

Terminalia capitanea, *T. psilantha*, and *T. crebrifolia* are at once distinguished from the preceding endemic species with winged fruits in their robust habit and large leaves and flowers. As previously discussed (Smith, 1971; Coode, 1973), such Fijian species probably represent an eastward extension of the alliance of *T. archipelagi* Coode and *T. rerei* Coode, but differences are obvious. The species of this relationship appear to have very narrow distributional ranges.

Flowering inflorescences of *Terminalia capitanea*, not available in 1971, are now known from *DA 18149* (coll. *S. Vodonaivalu & L. Kolinisau*, Jan. 20, 1972) (K, MASS, SUVA) and may be noted as follows:

Inflorescences axillary, spicate, at anthesis to 30 cm. long, the flowers 30 or more, readily caducous, the peduncle (3–7 cm. long) and rachis slender, sparsely appressed-hirtellous with stramineous hairs 0.2–0.3 mm. long; flowers 5–merous, the bracts elliptic, 7–8 × 3 mm., obtuse, copiously sericeous on both sides, soon caducous; lower receptacle closely sericeous with stramineous hairs 0.1–0.3 mm. long, that of ♂ flowers ellipsoid, somewhat flattened, 7–10 mm. long, at anthesis about 4 mm. broad in middle, that of ♂ flowers cylindrical, 4–7 mm. long, 1–1.5 mm. broad; calyx limb subcarnose, glabrous, cupuliform, 6–8 mm. long, 12–14 mm. in diameter, the lobes deltoid, 4–5 mm. long and broad, acute; disk pulvinate, about 5 mm. broad, copiously hirtellous, conspicuously 5-lobed, the lobes emarginate; stamens 10, the filaments at anthesis 12–17 mm. long, the anthers oblong-ellipsoid, about 1.5 mm. long; style subcarnose, that of ♀ flowers 12 mm. long and probably elongating, that of ♂ flowers inconspicuous, 2–3 mm. long.

9. *Terminalia psilantha* A. C. Sm., sp. nov.¹ FIGURES 83D, 85B & C, 86A & B.

A forest tree, presumably occurring at low or moderate elevation, and collected in advanced bud in May. The species is characterized by its essentially glabrous, robust habit, with stout branchlets and densely congested foliage, differing from the related *T. capitanea* and *T. crebrifolia* by combinations of its features of leaves and inflorescences.

TYPIFICATION: The type is DF 192 (DA L.30919) (coll. *Asaeli Masoqiri*) (BISH HOLOTYPE; ISOTYPE at SUVA), collected May 23, 1979, in Mathuata Province without further locality, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from the type collection from Vanua Levu.

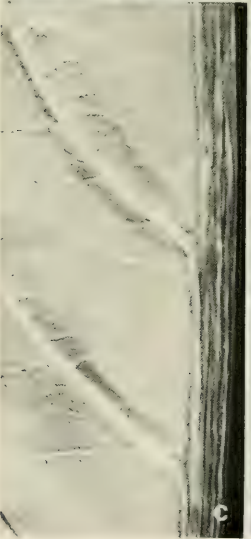
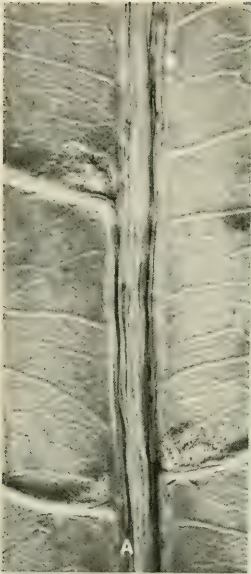
LOCAL NAME: *Mbausomi*.

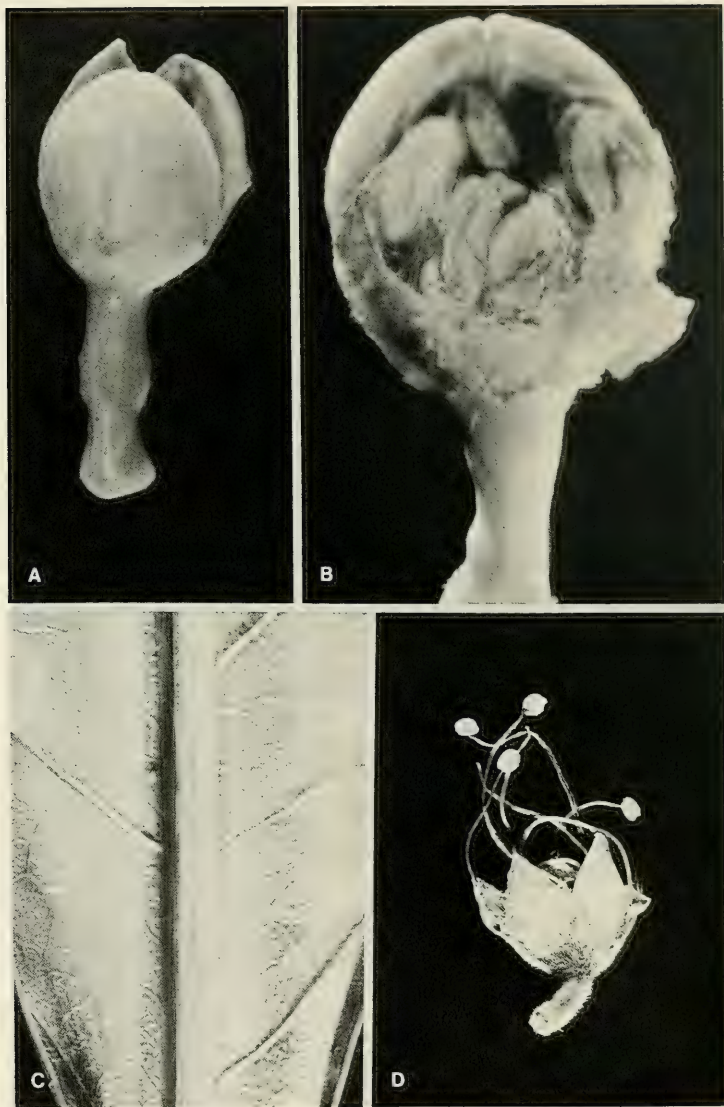
Terminalia psilantha is obviously of the immediate relationship of *T. capitanea* and *T. crebrifolia*, but it cannot be referred to either of those species, differing from both in having its youngest parts essentially glabrous rather than sericeous. From *T. crebrifolia* it more obviously differs in having its inflorescences and flowers completely

¹*Terminalia psilantha* A. C. Sm., sp. nov.

Arbor, partibus novellis praeter pilos paucos dispersos adpressos stramineos 0.2–0.5 mm. longos evanidos admodum glabris, ramulis robustis glabris infra folia apice dense congesta 10–12 mm. diametro et copiose cicatricosis; foliis ubique glabris sine domatiis; petiolis crassis (2–3 mm. latis) supra canaliculatis 17–25 mm. longis apicem versus (vel basi laminarum) glandulas ovas elevatas conspicuas 2–3 mm. longas ferentibus; foliorum laminis coriaceis obovato-lanceolatis, 13–18 cm. longis, 5–8 cm. latis, basim versus gradatim angustatis in petiolum longe decurrentibus et petioli glandula confluentibus, apice rotundatis et vadose emarginatis, margine integris undulatis anguste revolutis, utrinque inconspicue glanduloso-pustulatis, costa valida supra elevata et anguste canaliculata subtus prominenti, nervis secundariis utrinsecus 9–11 angulo plus minusve 45° ascendentibus haud arcuatis supra anguste impressis subtus valde elevatis, rete venularum copioso subtransverso utrinque prominulo; inflorescentiis axillaribus spicatis sub anthesi 7–9 cm. longis praeter pilos intra calycis limbo ubique glabris, pedunculo (ad 3 cm. longo) et rhachidi gracilibus, floribus 25–30 facile caducis, bracteis anguste oblongis circiter 2 mm. longis obtusis recurvis; floribus 5–meris (rarius 4–meris) fere sub anthesi 5–7.5 mm. longis; receptaculo inferiore cylindrico 2–3.5 mm. longo, calycis limbo carnoso in alabastro subgloboso 3–4 mm. longo et 3–3.5 mm. lato sub anthesi sine dubio campanulato ad 8 mm. diametro, lobis ovato-deltaeoides 3–3.5 mm. longis subacutis; disco pilis 1.5–2 mm. longis copiose hirtello; staminibus 10 (8), filamentis in alabastro brevibus, antheris oblongis 1–1.2 mm. longis basi et apice rotundatis; fructibus ignotis. HOLOTYPE: FIJI: VANUA LEVU: MATHUATA: DF 192 (coll. *Asaeli Masoqiri*) (BISH).

FIGURE 85. A, *Terminalia capitanea*; portion of lower surface of leaf blade, showing domatia, × 4. B & C, *Terminalia psilantha*; B, distal portion of branchlet, with foliage and an inflorescence with advanced buds, × 1/3; C, portion of lower surface of leaf blade, lacking domatia, × 4. D, *Terminalia crebrifolia*; distal portion of branchlet, with foliage and inflorescences with advanced buds, × 1/3. A from DA 17355, B & C from DF 192, D from DA 17002.





glabrous (except for disk hairs) rather than copiously and persistently sericeous-villose. Foliage differences are not significant, both species lacking domatia (FIGURES 85C, 86C) (or these very infrequent and small in *T. crebrifolia*). As fruits are unknown for the new species a comparison in this respect cannot be made, except that the fruits of *T. psilantha* will obviously lack the indument characterizing those of *T. crebrifolia* (FIGURE 80E). The new species is also a close ally of *T. capitanea*, but that species has its inflorescence rachis, flower-subtending bracts, and the lower receptacle of its flowers with a noticeable amount of indument (which, however, does not persist in fruit). Additionally, *T. capitanea* has flowers presumably substantially larger (although this cannot be emphasized because of the lack of mature flowers for *T. psilantha*). From *T. capitanea*, *T. psilantha* further differs in its leaves with longer petioles that have more conspicuous marginal glands, by leaf blades that are completely glabrous from the earliest stages, lack domatia (these being conspicuous and copiously tomentellous in *T. capitanea*, FIGURE 85A), and have the secondary nerves more sharply ascending and nearly straight. Species of this relationship in Fiji appear to be narrowly endemic, *T. capitanea* being known only from southeastern Viti Levu, *T. crebrifolia* only from west-central Vanua Levu, and *T. psilantha* only from the type collection, from Vanua Levu but unfortunately without locality other than Mathuata Province.

10. *Terminalia crebrifolia* A. C. Sm. in *Brittonia* 23: 402. 1971; Coode in *Contr. Herb. Austral.* 2: 3. 1973. FIGURES 80E, 85D, 86C & D.

Tree 15–22 m. high, with a trunk to 50 cm. in diameter, found at elevations of 60–300 m. in dense forest on ridges and slopes; the flowers are yellowish. Flowers have been obtained in May, fruits in September.

TIPIFICATION: The type is *Berry 34* (coll. *Damanu*) (BISH HOLOTYPE; ISOTYPE κ), collected Sept. 27, 1968, at Nukumatacinga (Bull Bros. timber concession), south of the Ndreketi River, Mathuata Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from west-central Vanua Levu.

LOCAL NAMES AND USE: A timber tree known locally as *mbausomi* and *tivi*.

AVAILABLE COLLECTIONS: VANUA LEVU: MATHUATA: On ridge 4 miles southwest of Ndreketi, *Mead 2008*; Ndreketi Plantation, grown from seed collected at type locality, *DA 16967*; Korovatu Matangali, south of Nambavatu on Ndreketi River, *DA 17001, 17002*. THAKAUNDOVE: Vicinity of (inland from?) Natua, near mouth of Navilangolango River, Wailevu Tikina, *DA 15700*. The several *DA* collections were obtained due to the interest of D. H. Bull, J. W. Parham, M. J. Berry, E. Damanu, K. Drakabuli, and M. Tulsa.

11. *Terminalia bellirica* (Gaertn.) Roxb. *Pl. Coromandel* 2: 54. *t. 198*, as *T. bellerica*. 1805; Brandis, *Forest Fl. N. W. India*, 222. 1874; C. B. Clarke in *Hook. f. Fl. Brit. Ind.* 2: 445, as *T. belerica*. 1878; Brandis, *Indian Trees*, 307, as *T. belerica*. 1906; Exell in *Fl. Males. I.* 4: 569. *fig. 14 (28), 20*. 1954; A. C. Sm. in *Brittonia* 23: 411. 1971; J. W. Parham, *Pl. Fiji Isl. ed. 2.* 207. 1972. FIGURE 81C.

Myrobalanus bellirica Gaertn. *Fruct. Sem. Pl.* 2: 90. *t. 97, fig. a-e*, as *M. bellirina*. 1790.

An infrequently cultivated tree to 15 m. high (where indigenous up to 50 m. high and with a trunk to 2 m. in diameter), near sea level. Fruits were noted in Fiji in January.

FIGURE 86. A & B, *Terminalia psilantha*: A, flower bud near anthesis, $\times 10$; B, flower bud near anthesis, with 3 calyx lobes and 1 stamen removed, $\times 20$. C & D, *Terminalia crebrifolia*: C, portion of lower surface of leaf blade, lacking domatia, $\times 4$; D, flower, some anthers fallen, $\times 4$. A & B from *DF 192*, C & D from *DA 15700*.

TYPIFICATION: Gaertner cited several older illustrations, but perhaps his description and illustration of the fruit should be taken as the type.

DISTRIBUTION: Ceylon and India through southeastern Asia and into Malesia as far east as the Moluccas and Kei Islands, cultivated elsewhere, in the Pacific at least on Rarotonga and in Hawaii as well as Fiji.

USES: The fruit supplies one of the commercial myrobalans used for tanning leather, as a dye, and for making ink; it is also reputed to have medicinal uses (cf. Exell, 1954; Burkill, Dict. Econ. Prod. Malay Penins. ed. 2. 2174–2176. 1966). The species was presumably introduced into Fiji by J. B. Thurston, being listed in his 1886 *Catalogue*, either as a shade tree or experimentally for its fruits.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Nasinu Experiment Station, DA 1567, 5514; Nasinu Approved School, Berry 219 (coll. J. Balawa).

12. ***Terminalia richii*** A. Gray, Bot. U. S. Expl. Exped. 1: 616. 1854; Christophersen in Bishop Mus. Bull. 128: 158. 1935; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 60. fig. 3. 1970; A. C. Sm. in Brittonia 23: 403. 1971; J. W. Parham, Pl. Fiji Isl. ed. 2. 207. 1972; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 60, 71. 1972. FIGURE 81D.

A tree infrequently cultivated near sea level, where indigenous up to 25 m. high and with a trunk to 1 m. in diameter above buttresses. The only available Fijian collection was from a sterile young plant, presumably experimentally grown.

TYPIFICATION: The type is *U. S. Expl. Exped.* (US 48051 HOLOTYPE; ISOTYPES at GH, NY), collected in 1839 on a coast of Upolu, Samoa.

DISTRIBUTION: *Terminalia richii* appears to be fairly frequent in Samoa, at least on Savaii, where it is one of the largest trees of the lowland forest. It is also apparently indigenous but rare on Niue. No cultivated specimens have been noted other than that in Fiji.

USE: Presumably introduced as a potential timber tree.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRE: Tholo-i-suva, Kalambo Block 34, DA 16430.

13. ***Terminalia catappa*** L. Syst. Nat. ed. 12. 674 (err. 638). 1767, Mant. Pl. 128. 1767; A. Gray, Bot. U. S. Expl. Exped. 1: 615. 1854; Seem. in Bonplandia 9: 256. 1861, Viti, 436. 1862, Fl. Vit. 93. 1866, op. cit. 429. 1873; Drake, Ill. Fl. Ins. Mar. Pac. 166. 1890; Hemsl. in J. Linn. Soc. Bot. 30: 176. 1895; Guillaumin in J. Arnold Arb. 12: 253. 1931; Christophersen in Bishop Mus. Bull. 128: 157. 1935; Yuncker in op. cit. 178: 89. 1943, in op. cit. 184: 54. 1945; Exell in Fl. Males. I. 4: 566. fig. 17, 18. 1954; Yuncker in Bishop Mus. Bull. 220: 198. 1959; J. W. Parham, Pl. Fiji Isl. 145. 1964, ed. 2. 207. 1972; Coode in Manual For. Trees Papua New Guinea 1 (rev.): 33. fig. 8. 1969; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 60. 1970; A. C. Sm. in Brittonia 23: 405. 1971; St. John & A. C. Sm. in Pacific Sci. 25: 336. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 117. 1972; Coode in Contr. Herb. Austral. 2: 9. 1973; Byrnes in Contr. Queensland Herb. 20: 36. fig. 5 (7). 1977; Coode in Handb. Fl. Papua New Guinea 1: 72. fig. 18 (9), 29. 1978; Fosberg & Sacht in Smithsonian Contr. Bot. 47: 14. 1981. FIGURE 81A.

As seen in Fiji, *Terminalia catappa* is a tree 5–25 m. high, locally abundant near sea level in beach thickets, on rocky shores, and on the edges of mangrove swamps, and occasionally found inland in dry or open forest near streams and in clearings to an elevation of 300 m. Its mature leaves characteristically turn bright red or yellow and are

then deciduous; the calyx limb and filaments are white; and the fruits turn from green to red. Flowers and fruits are found throughout much of the year.

TIPIFICATION: In 1931 (in J. Bot. 69: 125) Exell indicated that *Terminalia catappa* is the only species of the genus represented in the Linnaean Herbarium, perhaps implying that the specimen there deposited is to be taken as the type of the species. However, as remarked by Merrill (Interpret. Rumph. Herb. Amb. 390. 1917), the species is based at least in part on *Catappa domestica* Rumph. Herb. Amb. 1: 174. t. 68. 1741.

DISTRIBUTION: Tropical Asia through Malesia to northern Australia and eastward into eastern Polynesia (although it cannot be indicated how far east the species is actually indigenous rather than aboriginally introduced), and now widely cultivated throughout the tropics. About 30 Fijian collections are at hand, but these do not adequately show the abundance of the species.

LOCAL NAMES AND USES: Recorded Fijian names are *tavola*, *tavola lato*, *tivi*, *sivi*, *tiviloa*, and *tatavola*; the species is also known as *beach almond* and *Fiji almond*. It is a very useful plant to Fijians: the seeds are edible, the timber is useful for houseposts and is utilized for making bowls and resonant drums (*lali*), and medicinal uses are ascribed to the leaves and bark.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Yalombi, *St. John 18094*. VITI LEVU: MBA: Lautoka, *Greenwood 148*; Nandi River, *DA 18050*. NANDRONGA & NAVOSA: Korolevu Bay, *DA L. 13690 (Berry 130)*. SERUA: Navutulevu, *DF 1038 (S1418/9)*; Namboutini, *DF 1037 (S1418/8)*. NAMOSI: Wainimakutu (far inland, cultivated in village?), *DA L. 13358 (Berry 73 or 77)*. RA: Viti Levu Bay, *DA 12776 (Melville et al. 7168)*. TAILEVU: Matavatathou, *DA 15361*. REWA: Lami, *DA 6007*; Rewa (Village), *Seemann 187*. MBE-NGGA: Raviravi, *DA 6074*. KORO: Eastern slope of main ridge, *Smith 998*. VANUA LEVU: THAKAUNDROVE: Maravu, near Salt Lake, *Degener & Ordenez 14163*. TAVEUNI: Waiyevo, *DA 16898*. NGGAMEA: Naiivivi Village, *Weiner 71-7-39*. MOALA: North coast, *Smith 1397*. TOTOYA: *Tothill 178*. VANUA MBALAVU: Near Lomaloma, *Garnock-Jones 1025*. LAKEMBA: Near Tumbou Jetty, *Garnock-Jones 762*. FIJI without further locality, *U. S. Expl. Exped.*

The related *Terminalia glabrata* Forst. f. (cf. Smith, 1971, p. 406) has been informatively discussed by Fosberg and Sachet (in Smithsonian Contr. Bot. 47: 14-17. 1981); those authors divide it into five varieties distributed from the Cook Islands to the Marquesas, Society, Austral, and Tuamotu Islands.

14. *Terminalia litoralis* Seem. Fl. Vit. 94. 1866; Yuncker in Bishop Mus. Bull. 220: 199. 1959; A. C. Sm. in Brittonia 23: 407. 1971.

DISTRIBUTION: Fiji and Tonga, with two varieties. Variety *litoralis* occurs in both archipelagoes, but var. *tomentella* Hemsl. ex Burkill appears to be endemic to Tonga. My 1971 treatment discusses distinctions between the two varieties and compares the species with the related *T. samoensis* Rechinger, a littoral species with a broad distribution from the Mangsee Islands, Celebes, New Ireland, and Micronesia eastward to the Marshall, Phoenix, and Society Islands and to Makatea in the Tuamotus. Curiously, although *T. samoensis* is frequent in Samoa, it appears to be replaced in Fiji and Tonga by *T. litoralis*. I believe (Smith, 1971) the two species to be more distinct from one another than implied by Coode (in Contr. Herb. Austral. 2: 26. 1973) and Fosberg and Sachet (in Smithsonian Contr. Bot. 47: 17. 1981).

14a. *Terminalia litoralis* var. *litoralis*; Yuncker in Bishop Mus. Bull. 220: 199. 1959; A. C. Sm. in Brittonia 23: 408. 1971; J. W. Parham, Pl. Fiji Isl. ed. 2. 207. 1972.

FIGURE 81B.

Terminalia litoralis Seem. Fl. Vit. 94. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 166, as *T. littoralis*. 1890; J. W. Parham, Pl. Fiji Isl. 145. 1964.

Terminalia moluccana sensu A. Gray, Bot. U. S. Expl. Exped. 1: 616. 1854; Seem. in Bonplandia 9: 256. 1861, Viti, 437. 1862; non Lam.

Terminalia glabrata sensu A. Gray, Bot. U. S. Expl. Exped. 1: 616. 1854; Seem. Viti, 437. 1862; non Forst. f.

A tree 3–12 (–18?) m. high, occurring with some frequency near sea level in coastal forest, on rocky shores, and sometimes on limestone cliffs or on the edges of mangrove swamps. The fragrant flowers have the calyx limb, filaments, and style white or greenish white and the anthers yellow; the fruits are yellow-green, turning rich pink to red. Flowers and fruits may be expected throughout the year.

TYPIFICATION: The type is *Seemann 188* (K HOLOTYPE; ISOTYPE at GH), collected in 1860 in Fiji and said by Seemann to be “common on the sandy sea-beaches; never found inland.”

DISTRIBUTION: Fiji and Tonga; the typical variety of *T. littoralis* is comparatively rare in Tonga, thus far recorded only from Nomuka and Tongatapu.

LOCAL NAMES AND USES: The recorded Fijian names, *tavola*, *tavola ni waitui*, *tatavola*, and *tivi*, do not distinguish the species from *T. catappa*, like which the timber is useful. The seeds are also edible but are said to be inferior in quality to those of *T. catappa*.

AVAILABLE COLLECTIONS: VITI LEVU: SERUA: Vunaniu, *DF 282 (Damanu 10)*. REWA: Lami, *DA 13236*; Nukulau Island, *Barclay 3461*. “OVALAU and ONEATA.” *U. S. Expl. Exped.* (GH, US 73804, as *T. moluccana*). NGAU: Shore of Herald Bay, vicinity of Sawaieke, *Smith 7914*. VANUA LEVU: THAKAUNDROVE: West of Valethi, *Bierhorst F112*; Ndromoninuku, *DA 16814*; Natimbia, *DA 13148*. RAMBI: *Horne 488*. MOALA: North coast, *Smith 1391*. MATUKU: *Bryan 280*. VANUA MBALAVU: Vicinity of Sawana Village, *Garnock-Jones 1058*. VANUA VATU: *Bryan 554*. FULANGA: On lagoon cliff, *Smith 1213*. ONGEA NDRIKI: *Bryan 416*. FIJI without further locality, *U. S. Expl. Exped.* (GH, US 73805, as *T. glabrata*).

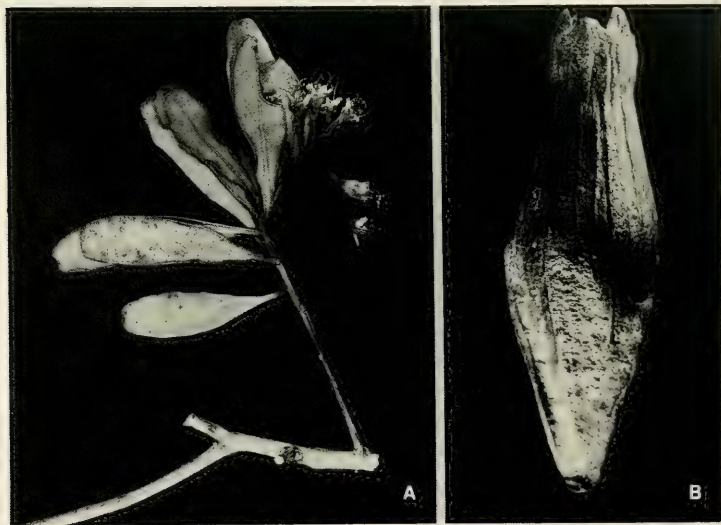


FIGURE 87. *Lumnitzera littorea*; A, distal portion of branchlet, with foliage, an inflorescence, and detached flowers, $\times 1/2$; B, fruit, showing small bracteoles adnate to hypanthium, $\times 3$. A from *Smith 482*, B from *Smith 9342*.

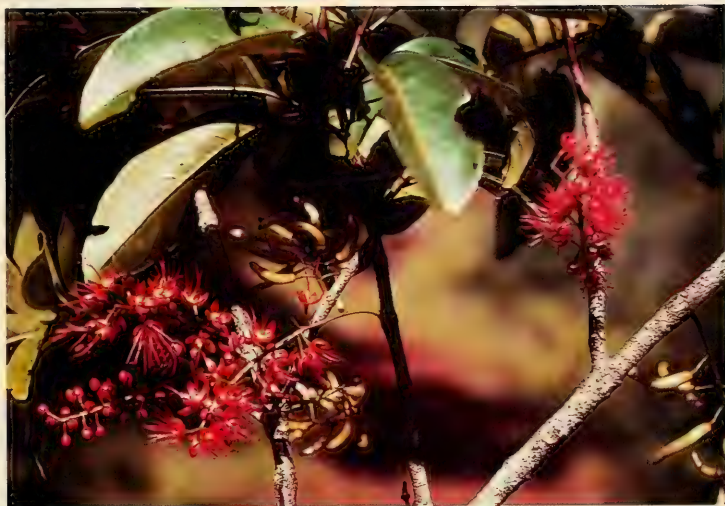


FIGURE 88. (Upper) Foliage, inflorescences, and young fruits of *Geissois ternata* var. *ternata* (Cunoniaceae), from Mba Province, Viti Levu (Smith 5969), \times about 1/3.

(Lower) A Fijian house showing the use of makita (*Atuna racemosa*, Chrysobalanaceae) leaves as a thatch for outside walls, in Tailevu Province, Viti Levu.



FIGURE 89. A tree of *Parinari insularum* (Chrysobalanaceae) in a patch of forest in Mathuata Province, Vanua Levu (Smith 6655).



FIGURE 90. *Metrosideros collina* var. *collina* (Myrtaceae), one of the dominant forest trees in north-central Viti Levu (no voucher, but *Smith 5330* is from the immediate vicinity, Mba Province, Viti Levu).



FIGURE 91. Inflorescence and foliage of *Syzygium gracilipes*, from Naitasiri Province, Viti Levu (photograph by William G. Ziarnik), \times about 1/2.



FIGURE 92. (Upper) Foliage and inflorescences of *Colubrina asiatica* (Rhamnaceae), a widespread scrambling shrub or a small tree commonly seen in beach thickets in Fiji, as here on the island of Taveuni (no voucher), \times about 2/3.

(Lower) *Medinilla longicymosa* (Melastomataceae), a liana developing into a compact epiphytic shrub, covering the branch of a tree near the summit of Mt. Tomanivi, Viti Levu (Smith 5185).



FIGURE 93. (Upper) Inflorescence of *Medinilla waterhousei* (Melastomataceae), the *tangimauthia*, often considered the most beautiful of Fijian endemic plants, from the "crater lake" area of Taveuni (Smith 8361). (Lower) *Medinilla spectabilis*, another high-climbing liana related to *M. waterhousei*, perhaps even rarer and known only from Taveuni (Smith 8362), \times about 1/4.



FIGURE 94. (Upper) Foliage and inflorescence of *Elattostachys falcata* (Sapindaceae), an abundant and striking tree, with red anthers that conceal the small red petals (Smith 8314, from Taveuni), \times about 1/4. (Lower) Foliage and inflorescences of *Koelreuteria elegans* (Sapindaceae), a conspicuous endemic tree in Fiji (Smith 4389, from the Mt. Evans Range, Mba Province, Viti Levu), \times about 1/5.

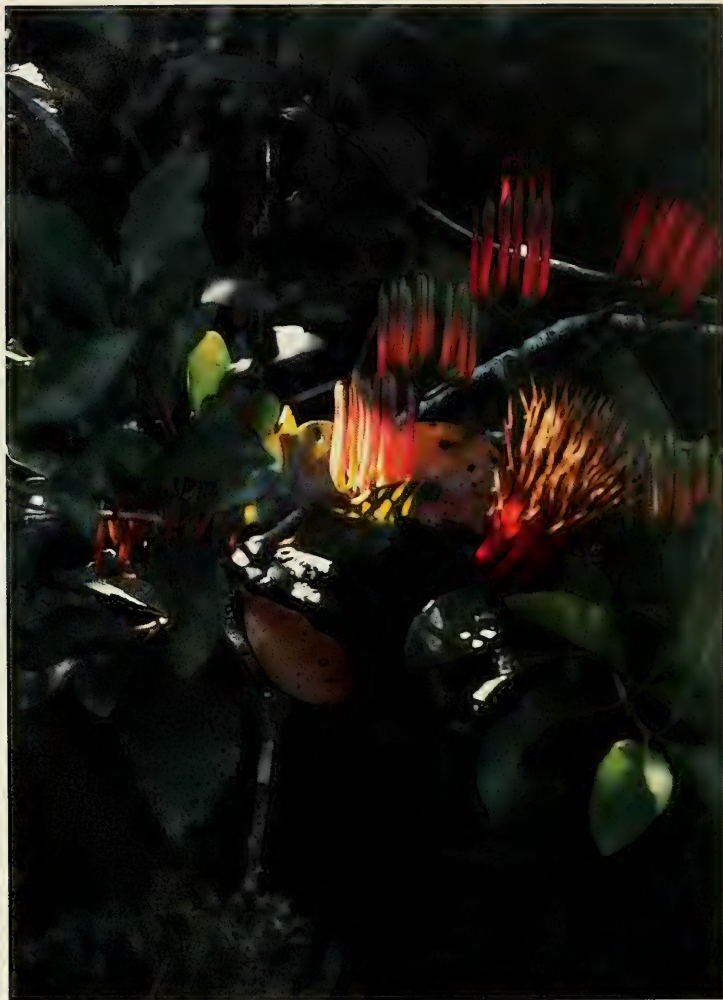


FIGURE 95. *Decaisnina forsteriana* (Loranthaceae), a shrubby parasitic mistletoe widely distributed in the southern Pacific, bears inflorescences forming bright patches in the forest of Mt. Nangaranambuluta, Mba Province, Viti Levu (no voucher), \times about $1/4$.

4. *Lumnitzera* Willd. in Ges. Naturf. Freunde Berlin Neue Schriften **4**: 186. 1803; Seem. Fl. Vit. **94**. 1866; Exell in J. Bot. **69**: 128. 1931, in Fl. Males. I. **4**: 585. 1954; Exell & Stace in Bol. Soc. Brot. II. **40**: 24. 1966; Coode in Manual For. Trees Papua New Guinea **1** (rev.): 79. 1969; Byrnes in Contr. Queensland Herb. **20**: 60. 1977; Coode in Handb. Fl. Papua New Guinea **1**: 48. 1978.

Evergreen trees or shrubs; leaves spirally arranged, sessile or nearly so, the blades fleshy to coriaceous, glabrous at maturity; inflorescences terminal or axillary, spicate or racemose, the flowers ♂, actinomorphic, 5-merous; hypanthium bearing 2 adnate, persistent bracteoles, produced into a calyx tube beyond ovary but not externally differentiated into an upper and lower part, the lobes persistent; petals caducous; stamens 5-10; disk absent or inconspicuous; ovules 2-5; style filiform, not adnate to calyx tube, persistent; fruit compressed-ellipsoid, with obtuse angles, subliguous.

TYPE SPECIES: *Lumnitzera racemosa* Willd.

DISTRIBUTION: East Africa and Madagascar to tropical Asia and eastward into Polynesia, with two species (and an occasional hybrid between them, cf. Tomlinson et al., 1978). One species is indigenous in Fiji.

USEFUL TREATMENT OF GENUS: TOMLINSON, P. B., J. S. BUNT, R. B. PRIMACK, & N. C. DUKE. *Lumnitzera rosea* (Combretaceae)—its status and floral morphology. J. Arnold Arb. **59**: 342-351. 1978.

1. *Lumnitzera littorea* (Jack) Voigt, Hort. Suburb. Calcut. 39. 1845; Guillaumin in J. Arnold Arb. **12**: 253. 1931; Exell in Fl. Males. I. **4**: 586. fig. 32, 33. 1954; Yuncker in Bishop Mus. Bull. **220**: 199. 1959; J. W. Parham, Pl. Fiji Isl. 145. 1964, ed. 2. 206. 1972; Coode in Manual For. Trees Papua New Guinea **1** (rev.): 81. fig. 31. 1969; Byrnes in Contr. Queensland Herb. **20**: 61. 1977; Tomlinson et al. in J. Arnold Arb. **59**: 342. fig. 4, 6, a, b. 1978; Coode in Handb. Fl. Papua New Guinea **1**: 48. fig. 15. 1978.

FIGURE 87.

Pyrrhanthus littoreus Jack in Malayan Misc. **2** (7): 57. 1822 (repr. in Calcutta J. Nat. Hist. **4**: 193. 1843). *Lumnitzera coccinea* Wight & Arn. Prodr. Fl. Ind. Orient. 316, nom. illeg. 1834; A. Gray, Bot. U. S. Expl. Exped. **1**: 615. 1854; Seem. in Bonplandia **9**: 256. 1861, Viti, 436. 1862, Fl. Vit. **94**. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 166. 1890.

A tree 3-9 m. high (to 25 m. in Malesia), often indicated as compact or spreading, or a shrub to 2 m. high, occurring and locally abundant near sea level in drier parts of mangrove swamps, in strand thickets, or in littoral forest. The leaf blades are narrowly obovate-elliptic and up to 8 × 2.5 cm.; the flowers are short-pedicellate and have the stamens and style conspicuously exserted. The calyx tube is green, the petals (about 4 mm. long), filaments, and style are bright red, the anthers pale yellow, and the fruits turning from green to brown. Flowers and fruits are to be found throughout the year.

TYPIFICATION AND NOMENCLATURE: For *Pyrrhanthus littoreus* Jack cited: "Native of Sumatra and the Malay Peninsula . . .," and: "*Mergui, Malacca. W. G.*" If "*W. G.*" refers to William Griffith, that quotation may have been only in the 1843 reprint and does not indicate the holotype, since Griffith was born in 1810; I have not seen the original publication. For *Lumnitzera coccinea* Wight and Arnott cited Jack's binomial as a synonym, their binomial thus being illegitimate.

DISTRIBUTION: Tropical Asia throughout Malesia to northern Australia, Micronesia, and eastward into Polynesia at least to Tonga. About 30 Fijian collections have been seen; although these are definitely only from the two largest islands (and Naingani Island), the species doubtless occurs elsewhere in the archipelago (Seemann, 1866). It seems abundant along the southeastern coasts of both Viti Levu and Vanua Levu, especially in the drier parts of mangrove swamps.

LOCAL NAMES AND USES: *Sanggali* is the usual name, but it has often been noted as *sangali* or *sangale*. The hard and durable timber is used for piles in water and is said to be resistant to borers; it has also been used for pit-props.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Vicinity of Lautoka, *Greenwood 308*. SERUA: Vicinity of Ngaloa, *Smith 9342*; vicinity of Wainiyambia, *Webster & Hildreth 14051*. NAMOSI: Near mouth of Melimeli Creek, *DA 11588*. TAILEVU: Naingani Island, *DA 3315*; Namata, *DA 2676*; seashore near Mbau Island, *Milne s. n.* REWA: Kalokolevu (Namuka Harbour), *DA 11014*; near Lami, *Gillespie 4611*; head of Suva Harbour, *Setchell & Parks 15151*. VANUA LEVU: MBUA: Mbua Bay, *U. S. Expl. Exped.* THAKAUNDROVE: Mbalanga, Savusavu Bay, *Degener & Ordenez 13901*; foot of Natewa Bay, *Smith 482*. FIJI without further locality, *U. S. Expl. Exped., Seemann 189* ("common on the beaches of all Fiji").

ORDER RUTALES

In most current angiosperm classifications (Lawrence, 1951; Melchior, 1964; Hutchinson, 1973; Takhtajan, 1980; Dahlgren, 1980), the orders Rutales (by Lawrence included in Geraniales) and Sapindales are maintained as separate, although with a high degree of individual interpretation as to their actual compositions and the breadth of their circumscriptions. The orders are combined by Thorne (1976) but are maintained at a subordinal level. Cronquist (1968, 1981) combines the basic elements of the two orders using the name Sapindales and including (in 1981) 15 families. Takhtajan's 1980 usage places 15 families in Rutales and 13 in Sapindales.

If the families of this complex relationship are to be grouped in separate orders (as is done here to follow Takhtajan's sequence), those placed in Rutales are inclined to have actinomorphic flowers, an intrastaminal disk, and mostly epitropous ovules, those placed in Sapindales more often have a tendency toward zygomorphic flowers, an extrastaminal disk, and apotropous ovules.

KEY TO FAMILIES OCCURRING IN FIJI

- Stipules usually lacking or, if present, small and soon caducous; leaves usually alternate (but in some genera opposite); ovules 1 or 2 per locule (occasionally many in Families 137 and 138); stamens often fewer than twice as many as petals (sometimes more in Families 137 and 138).
- Ovule solitary in each carpel or locule, apotropous, pendulous from apex or adnate to ovary wall or pendulous from a basal funicle; gynoecium syncarpous or sometimes apocarpous but if syncarpous often 1-locular by abortion; fruit commonly drupaceous; plants resiniferous and often with allergenic resin. 133. ANACARDIACEAE
- Ovules 1 or 2 (-many) per locule, epitropous, axile, apical, or basal (placentation rarely intruded-parietal in a unilocular ovary); gynoecium syncarpous or apocarpous; plants resiniferous or not, but resin not allergenic.
- Bark and wood with prominent, specialized resiniferous ducts; leaves imparipinnate or trifoliolate, rarely unifoliolate, the blades usually glandular-punctate; fruit drupaceous, with 1-5 1-seeded pyrenes or with 1 plurilocular pyrene. 134. BURSERACEAE
- Bark and wood without prominent resiniferous ducts; leaves pinnately compound to unifoliolate or simple; fruit various.
- Filaments free, or at least not united into a tube bearing sessile anthers; disk annular to cupuliform, semiglobose, or cylindrical, sometimes lacking; gynoecium with free or united styles.
- Leaf blades not glandular-punctate; plants lacking aromatic ethereal oils in secretory cavities.
- Bark usually bitter; leaves pinnately compound to unifoliolate or simple; flowers ♂ or unisexual by partial abortion of parts, 3-8-merous; disk usually well developed; gynoecium composed of 1-5 (-8) carpels, these weakly to firmly united or forming a plurilocular ovary, the ovules usually 1 per carpel; fruit in our genera drupaceous. 135. SIMAROUBACEAE
- Bark not bitter; leaves simple, small, congested; flowers ♂, 5-merous; disk lacking; carpels 5, free, the ovules 2 per carpel; fruit composed of 3-5 drupes enclosed by calyx. 136. SURIANACEAE

- Leaf blades usually obviously glandular-punctate; leaves pinnately compound, trifoliolate, unifoliolate, or simple, the petioles and/or rachises sometimes winged; carpels sometimes free, sometimes partially or completely united, the styles free, coherent, or united; fruit a follicle-tum, capsule, schizocarp, drupe, or berry; plants often with secretory cavities containing aromatic ethereal oils. 137. **RUTACEAE**
- Filaments usually completely or partially connate into a tube (rarely completely free and then proximally adnate to androgynophore); bark bitter and astringent; disk sometimes conspicuous and tubular to cyathiform; ovary with a single style; fruit a berry or capsule, less often a drupe or nut, the seeds sometimes winged, sometimes with a fleshy arillode or sarcotesta; leaves variously pinnate or simple, the blades not glandular-punctate. 138. **MELIACEAE**
- Stipules well developed, persistent; leaves usually opposite, in our genus paripinnate; ovules usually epitropous, in our genus 3 or more per locule; stamens (in our genus) twice as many as petals; a single rare adventive in Fiji. 139. **ZYGOPHYLLACEAE**

FAMILY 133. ANACARDIACEAE

ANACARDIACEAE Lindl. *Intr. Nat. Syst.* 127. 1830.

Trees or shrubs (our species) or woody vines, often polygamodioecious and with resiniferous bark and caustic juice, the stipules absent or very rarely present and obscure; leaves alternate or rarely opposite, often congested at ends of branchlets, simple or compound, the blades usually entire; inflorescences terminal or axillary, paniculiform to racemose or spiciform, the bracts and bracteoles usually caducous; flowers essentially actinomorphic, usually hypogynous, ♂ or unisexual by abortion, prevailingly 5-merous; calyx with 5 (3-7) lobes, these free or connate, valvate or imbricate; petals 5 (or 3-7, rarely lacking), free or rarely connate, imbricate or valvate; disk variously shaped but usually 5- or 10-lobed, infrequently obscure or lacking; stamens 3-10, rarely more, usually inserted at base of disk, usually all fertile, infrequently sterile, rudimentary, or lacking, the filaments free (infrequently basally connate), the anthers often versatile and dorsifixed, sometimes basifixed, usually introrse, longitudinally dehiscent; gynoecium syncarpous or sometimes apocarpous, the ovary superior or slightly immersed in receptacle, 1-locular or with 2-5 (rarely as many as 12) locules, the carpels infrequently free, the ovule solitary in each carpel or locule, apotropous, pendulous from apex or adnate to ovary wall or pendulous from a basal funicle, the styles 1-5 (-12), often widely separated, sometimes connate, the stigmas distinct or obscure; fruits mostly drupaceous, sometimes subtended by an enlarged, fleshy hypocarp, the pyrene with 1-5 (-12) cells, the seed(s) without or with very thin endosperm, the cotyledons usually fleshy and free.

DISTRIBUTION: Pantropical but also extending into temperate areas, with approximately 70 genera and at least 600 species. The family is economically important for the fruits of *Mangifera*, *Anacardium*, and other genera, for various ornamentals, and as a source of lacquer and resins. It is also well known for the poisonous volatile oils of several genera.

USEFUL TREATMENTS OF FAMILY: ENGLER, A. *Anacardiaceae*. DC. *Monogr. Phan.* 4: 171-500. 1883. ENGLER, A. *Anacardiaceae*. Engl. & Prantl, *Nat. Pflanzenfam.* III. 5: 138-178. 1892. ROYEN, P. VAN. *Anacardiaceae*. *Manual For. Trees Papua New Guinea* 4: 1-44. 1964. DING HOU. *Anacardiaceae*. *Fl. Males.* 1. 8: 395-548. 1978. MEIJER, W. *Anacardiaceae*. *In: Dassanayake, M. D., & F. R. Fosberg. Rev. Handb. Fl. Ceylon* 4: 1-24. 1983.

The basic treatments of the family by Engler, although a century old, have provided a sequence of genera followed in many floristic discussions. Eleven genera and 13 species are recorded from Fiji. Six of the genera are represented by eight apparently indigenous species, of which two or three are endemic and one other may conceivably have been an aboriginal introduction. Five genera have been more recently introduced and each is represented by a single cultivated species, although two of these species have also become naturalized.

The genera here included are readily separable by obvious and nontechnical characters. Of the cultivated (or naturalized) genera, *Mangifera* and *Anacardium* have simple leaves and very distinctive edible fruits known to all visitors to the tropics. *Harpephyllum* and *Pistacia*, with imparipinnate leaves, are rare ornamental curiosities; the first has a fruit with a thin, edible pulp, and the second was probably introduced as a shade tree, having small, scarlet to purple fruits. One species of *Schinus*, also with imparipinnate leaves, bears attractive red fruits and has become sparingly naturalized.

Of the six genera with apparently indigenous species, *Buchanania* and *Semecarpus* have simple leaves, the former having comparatively small, lentiform fruits, and the latter with larger fruits borne on a swollen hypocarp. Visitors to the Fijian forest should be aware that *Semecarpus* produces an oil that may cause violent skin irritation. Of the indigenous (or aboriginally introduced) genera with imparipinnate leaves, *Spondias* and *Dracontomelon* bear edible fruits; the first, with leaflet blades with an obvious intramarginal nerve, is thus readily distinguished from the second. Of the two remaining genera with imparipinnate leaves, *Pleiogynium* has a comparatively large, turbinate, several-seeded fruit, while *Rhus* has a small fruit with a solitary seed.

KEY TO GENERA

- Carpels free and 4-6 or solitary, the style often lateral; ovule pendulous from a basal funicle; leaves simple, with entire blades.
- Stamens twice as many as petals, all fertile; carpels 4-6, usually only 1 of them fertile; drupe lentiform; indigenous. 1. *Buchanania*
- Stamens 5-10 but usually only 1 fertile; carpel solitary; drupe not lentiform; introduced trees with edible fruits, cultivated or naturalized.
- Drupe ovoid or subreniform, carnose, the mesocarp succulent and edible, the endocarp fibrous, the hypocarp only slightly enlarged. 2. *Mangifera*
- Drupe reniform, laterally compressed, the hypocarp greatly enlarged, pyriform, soft, 3-4 times longer than drupe. 3. *Anacardium*
- Carpels connate, united into a compound pistil.
- Drupe usually with 4 or 5 or more seeds (rarely 1- or 2-seeded by abortion); carpels 4 or 5 or more; ovules pendulous from a funicle attached near apex of locule; leaves (in our species) imparipinnate.
- Petals valvate; leaflet blades with an obvious intramarginal nerve. 4. *Spondias*
- Petals imbricate, at least distally; leaflet blades without an obvious intramarginal nerve.
- Styles free proximally, connate distally, the stigma subpyramidal, 5-angled; petals connivent or valvate proximally, imbricate toward apex; drupe subglobose-flattened, the mesocarp carnose, edible. 5. *Dracontomelon*
- Styles shortly divergent; petals imbricate to base.
- Drupe turbinate, slightly angled proximally, the mesocarp woody, the endocarp 5-12-locular; styles with spatulate stigmas, at length spreading or reflexed; indigenous. 6. *Pleiogynium*
- Drupe oblong-obovoid, the mesocarp thin, acid, the endocarp 4-locular with 2 locules larger than the others; styles with peltate stigmas, short; in Fiji cultivated only. 7. *Harpephyllum*
- Drupe 1-locular, 1-seeded; carpels 3, of which only 1 develops.
- Ovary obviously superior; ovule pendulous from a basal funicle or this attached to wall of locule; drupe without a conspicuous hypocarp; leaves (in our species) imparipinnate.
- Flowers without petals, with a bract, 2 prophylls, and 1-5 scarious sepals; in Fiji cultivated only. 8. *Pistacia*
- Flowers with both sepals and petals.
- Stamens 10 (or 8); ovule pendulous from a funicle attached near apex of locule; styles united proximally, with free stigmas; seed compressed, sublentiform; in Fiji cultivated or naturalized. 9. *Schinus*
- Stamens 5; ovule pendulous from a basal funicle; styles 3, free; seed ovoid to reniform; indigenous. 10. *Rhus*
- Ovary adnate to or slightly immersed in receptacle; ovule pendulous from a funicle attached above middle or near apex of locule; drupe borne on a swollen hypocarp; leaves simple; indigenous. 11. *Semecarpus*

1. *BUCHANANIA* Spreng. in J. Bot. (Schrader) **1800** (2): 234. 1802; Seem. Fl. Vit. 49. 1865; Engl. in DC. Monogr. Phan. **4**: 179. 1883; van Royen in Manual For. Trees Papua New Guinea **4**: 6. 1964; Ding Hou in Fl. Males. I. **8**: 412. 1978; Meijer in Rev. Handb. Fl. Ceylon **4**: 3. 1983.

Trees, the leaves alternate, simple, the blades coriaceous, entire, with numerous secondary nerves; inflorescences axillary toward branchlet apices, paniculate, the flowers ♂, 5 (rarely 4- or 6)-merous; calyx small, deeply divided into imbricate, obtuse lobes; petals imbricate, oblong, at length spreading or recurved, glabrous; disk urceolate, crenulate; stamens twice as many as petals, inserted outside disk, the filaments elongate, in our species subulate distally and bearing sagittate, basifixed anthers; carpels 4-6, free, usually only 1 fertile, 1-ovuled, the styles slender, short, the stigmas obliquely truncate; fruit lentiform, orbicular in outline, the style base subpersistent, the seed gibbous.

TYPE SPECIES: *Buchanania lanzan* Spreng.

DISTRIBUTION: Tropical Asia and Malesia to Australia and eastward to Samoa; there are probably more than 30 species. Two species are indigenous in Fiji, both belonging in Engler's series *Sagittatae*.

KEY TO SPECIES

- Petioles comparatively short and stout, 0.4-1 cm. long, 4-5 mm. in diameter; leaf blades obovate-oblong to broadly obovate, usually about twice as long as broad, 15-30 × 6-14.5 cm., cuneate-narrowed to broadly obtuse at base, rounded or obtuse and shallowly emarginate at apex; in beach thickets or forest near sea. 1. *B. vitiensis*
- Petioles comparatively long and slender, (1.5-) 2-9 cm. long, usually 1-3 mm. in diameter; leaf blades oblong to narrowly obovate, 3-4 times as long as broad, 12-28 × 3-11 cm., long-attenuate at base, obtusely short-acuminate (apex to 1 cm. long) or obtuse to narrowly rounded and slightly emarginate at apex; in lowland forest but not on beaches. 2. *B. attenuata*

1. *Buchanania vitiensis* Engl. in DC. Monogr. Phan. **4**: 186. 1883; J. W. Parham, Pl. Fiji Isl. 176. 1964, ed. 2. 249. 1972. FIGURE 96A.

Buchanania florida sensu A. Gray, Bot. U. S. Expl. Exped. **1**: 366. 1854, Atlas, pl. 44. A. 1856; Seem. in Bonplandia **10**: 296. 1862, Viti, 435. 1862, Fl. Vit. 50. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 144. 1890; non Schauer.

A tree 8-18 m. high, with a trunk to 40 cm. in diameter, occurring from near sea level to a slight elevation of about 80 m. in beach thickets or in lowland forest near sea. The petals are cream-white, the carpels purple with reddish stigmas, and the fruits deep purple. Flowers have been obtained between August and December and fruits between December and March.

TIPIFICATION: The type is *Storck 882* (B HOLOTYPE presumably destroyed; K LECTOTYPE here designated; ISOTYPE at BM). The type material was obtained on the island of Wakaya in November, 1860, although Seemann in 1865 had noted the Storck collection as from "Ovalau and Wakaya," probably because of Storck's notation that the species is "a hard timber tree, from which the natives about Ovalau make their canoe paddles." It is possible that the species does occur on Ovalau and other small islands in that area, but no such herbarium material is available.

DISTRIBUTION: Endemic to Fiji, and thus far known with certainty only from Wakaya (in Loma-i-Viti), coastal Vanua Levu (or offshore islands?), and the Lau Group; seven collections are at hand.

LOCAL NAMES AND USE: Recorded names are *uko* and *kaukaro* (both from Komo), *uto* (Kambara), and "*damanu ni Yaqqa*" (Parham, 1964, 1972). The last of these was apparently first listed by H. B. R. Parham (Names of a few Fijian plants and their botanical equivalents, p. 3, as *damanu yaqqa*. 1935), who indicated that name to be

from Mbua Province. *Ndamanu* usually refers to *Calophyllum* (which similarly includes hard timber trees), and the place name doubtless refers to Yangganga, an island off the northwestern coast of Vanua Levu (Mbua Province). *Ndamanu ni Yangganga* would be an interesting and perhaps logical name, as the island was certainly visited by members of the U. S. Exploring Expedition; occurrence of the species there (rather than on Vanua Levu proper as indicated below) would emphasize its penchant for small or offshore islands. Only Storck, as stated above, has noted this species as having useful wood, but *ndamanu* seems to corroborate his observation.

AVAILABLE COLLECTIONS: VANUA LEVU without further locality; U. S. Expl. Exped. YATHATA: DA 13623. AIWA: Bryan 492 B. KOMO: Bryan 492. KAMBARA: On limestone, Smith 1264. FULANGA: On limestone, Smith 1185.

2. *Buchanania attenuata* A. C. Sm. in Bishop Mus. Bull. **141**: 87, fig. 45. 1936, in J. Arnold Arb. **31**: 289. 1950; J. W. Parham, Pl. Fiji Isl. 176. 1964, ed. 2. 249. 1972.

FIGURE 96B-D.

The distinctive *Buchanania attenuata* occurs from near sea level to about 610 m. in dense or dry forest, on edges of forest, and in forest patches in open country. It is a tree 3-18 m. high, with clear latex and with a trunk 15 cm. or more in diameter. The petals, stamens, and styles are white or yellowish, and the fruits become purple at maturity. Flowers and fruits do not appear seasonal.

TIPIFICATION: The type is *Smith 108* (BISH HOLOTYPE; many ISOTYPES), collected Oct. 14, 1933, in hills above Namalata and Ngaloa Bays, Kandavu.

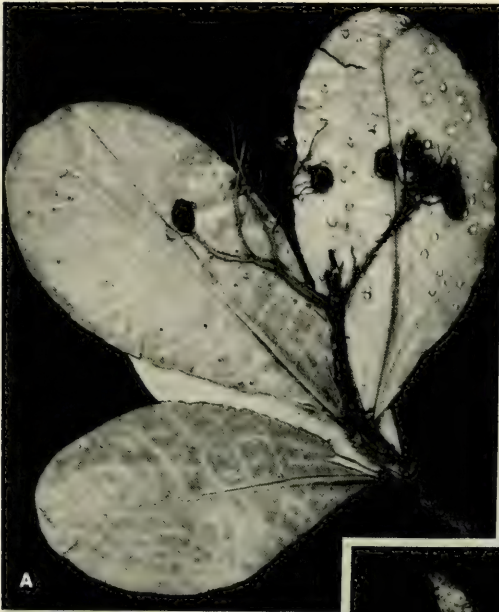
DISTRIBUTION: Probably endemic to Fiji, and thus far known from only four of the high islands, often being locally abundant. Apparently the earlier collectors overlooked the species, of which I have now seen 26 collections, about half of them from Mathuata Province, Vanua Levu.

LOCAL NAMES AND USE: Recorded names are *kaukaro*, *manggo ni veikau* (*bush mango*), and *mbausomi*; the latter usually refers to *Terminalia*, like many species of which this *Buchanania* is considered a usable timber tree.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Naloto Range, DA 14758: Nawai sheep farm, Berry, Feb. 12, 1968. NANDRONGA & NAVOSA: Nausori Highlands, DA 15610. SERUA: Coastal hills in vicinity of Taunovo River, east of Wainiyambia, Smith 9590. NAITASIRE: Upper Navatuvula Village, Waimanu River, DA 15690; vicinity of Nasinu, DA 11804. VANUA LEVU: MBUA: Rukuruku Estate, H. B. R. Parham 342. MATHUATA: Seanggangga area, Smith 6891, DA 13927; mountains along Mathuata coast, Greenwood 635. MOALA: Near Naroi, Smith 1310.

The Samoan *Buchanania merrillii* Christophersen (in Bishop Mus. Bull. **154**: 14. 1938; *B. macrocarpa* Merr. in Carnegie Inst. Wash. Publ. **341**: 75. 1924, non Lauterb., 1920) is quite similar in general facies to *B. attenuata*, but, as indicated by Merrill, it belongs in Engler's series *Adnatae*, with quite different stamens than the Fijian species, and the Samoan taxon also has substantially larger fruits. Whitmore (in Gard. Bull. Singapore **22**: 4. 1967) has recorded *B. attenuata* from the Santa Cruz Islands on the basis of *BSIP 1656* (duplicate seen at κ), which appears to me to represent *B. solomonensis* Merr. & Perry (in J. Arnold Arb. **22**: 530. 1941). The latter species is referred by Ding Hou (1978, p. 417) to the synonymy of *B. arborescens* (Bl.) Bl., a species said to extend from southeastern Asia and Formosa to the Solomon Islands and Australia. The Fijian population of this relationship differs from typical *B.*

FIGURE 96. A, *Buchanania vitiensis*; distal portion of branchlet, with foliage and infructescences, $\times 1/3$. B-D, *Buchanania attenuata*; B, part of infructescence and a fruit, $\times 2$; C, flower, $\times 8$; D, distal portion of branchlet, with foliage and inflorescences, $\times 1/3$. A from Smith 1264, B from Smith 1310; C & D from DA 11804.



A



B



C



D

arborescens in its lack of indument except for evanescently sericeous young parts. In its typical phase, *B. arborescens* has the younger parts, branchlets, leaf blades beneath especially on costa and nerves, and inflorescence branches copiously brown-pilose. In other respects the longer petioles characterize *B. attenuata* (those of *B. arborescens* seldom exceeding 4 cm. in length), as a rule the leaf blades of *B. attenuata* are proportionately the narrower, and its mature fruits are as much as 15 mm. long and broad.

Buchanania arborescens, in Ding Hou's 1978 interpretation, includes 21 names that have been utilized at the species level by one or more authors, as well as several infraspecific concepts. Of course it may prove reasonable to utilize such a broad "catch-all" concept for most Indo-Malesian and Melanesian individuals of ser. *Sagittatae*, but a reconsideration of the complex seems desirable. At least some of the Solomon Islands material may prove better placed in *B. attenuata* (which in that case would not be a Fijian endemic), being similarly glabrous in aspect and with petioles sometimes 5 cm. long.

2. *MANGIFERA* L. Sp. Pl. 200. 1753; Engl. in DC. Monogr. Phan. 4: 195. 1883; van Royen in Manual For. Trees Papua New Guinea 4: 27. 1964; Ding Hou in Blumea 24: 21. 1978, in Fl. Males. I. 8: 423. 1978; Meijer in Rev. Handb. Fl. Ceylon 4: 6. 1983.

Usually andromonoecious trees, the leaves alternate, often crowded at apices of branchlets, simple, the blades often coriaceous, entire, glabrous; inflorescences terminal and distally axillary, paniculate, many-flowered, the flowers 4- or 5-merous; sepals imbricate, essentially free; petals imbricate, with 3-5 basally connate nerves, distally recurved; disk usually extrastaminal and cupuliform or pulvinate; stamens usually 5 but usually only 1 fertile, inserted on disk margin, the filaments filiform, the anthers medifixed; gynoecium composed of a single carpel, the ovary 1-celled, 1-ovuled, the style excentric or lateral, the stigma inconspicuous; fruit a carnos, ovoid or subreniform drupe with often fleshy mesocarp, the pyrene compressed, 1-seeded.

TYPE SPECIES: *Mangifera indica* L., the only original species.

DISTRIBUTION: *Mangifera*, with 35-40 species, occurs indigenously from India and southern China into Malesia to the Solomon Islands. One species is ubiquitously cultivated in the tropics and subtropics.

1. *Mangifera indica* L. Sp. Pl. 200. 1753; Engl. in DC. Monogr. Phan. 4: 198. 1883, in Engl. & Prantl, Nat. Pflanzenfam. III. 5: 146. fig. 93. 1892; Yuncker in Bishop Mus. Bull. 178: 77. 1943, in op. cit. 184: 48. 1945; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 96. 1948, in op. cit. 29: 33. 1959; Yuncker in Bishop Mus. Bull. 220: 170. 1959; J. W. Parham, Pl. Fiji Isl. 176. 1964, ed. 2. 249. 1972; Pursglove, Trop. Crops, Dicot. 24. fig. 2. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 42. 1970; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 70. 1972; Ding Hou in Fl. Males. I. 8: 427. 1978; Meijer in Rev. Handb. Fl. Ceylon 4: 6. 1983.

The common *mango*, introduced for its fruits, is now often abundantly naturalized in dry areas and along roads and trails as a shade tree from near sea level to about 800 m. It is a dense-foliaged tree attaining a height of 25 m. in Fiji, the petals being cream-colored to pink and with yellow markings within. Flowers usually occur between June and October, and the best fruiting season is in January and February.

TYPIFICATION: I have not searched the literature for a lectotypification of the species, for which Linnaeus gave five prior references.

DISTRIBUTION: Probably originally native in India or Burma, the *mango* is now cultivated with a host of forms throughout warmer parts of the world. In spite of its abundance, only the few collections listed below are available from Fiji. Although it was listed by J. B. Thurston in his 1886 *Catalogue*, the species was probably an earlier European introduction.

LOCAL NAMES AND USES: *Manggo*, *am*; the fruit, of course, is valued, and the usefulness of the species as a shade tree is indicated by its occurrence along most dry roads and trails in Fiji. Many other uses are detailed by Burkill (Dict. Econ. Prod. Malay Penins. ed. 2. 1426-1429. 1966) and others (cf. Ding Hou, 1978, for references).

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Ndrasa, Farm Training School, DA 11401. TAILEVU: Wainimbokasi, DA 814. REWA: Suva, Health Office compound, DA 14277. NGAU: Shore of Herald Bay, vicinity of Sawaieke, Smith 7948. VANUA LEVU: MATHUATA: Ndreketi Plantation, DA 16969. VANUA MBALAVU: Slopes of Korolevu, near Lomaloma, Garnock-Jones 1022, 1044. LAKEMBA: Tumbou Valley, Garnock-Jones 859.

3. *ANACARDIUM* L. Sp. Pl. 383. 1753; Engl. in DC. Monogr. Phan. 4: 215. 1883; Ding Hou in Fl. Males. 1. 8: 420. 1978; Meijer in Rev. Handb. Fl. Ceylon 4: 7. 1983.

Polygamodioecious trees, the leaves alternate, simple, with coriaceous, entire, glabrous blades; inflorescences terminal and distally axillary, paniculate or forming a large, many-flowered corymb, the flowers small; calyx deeply 5-lobed, the lobes erect, imbricate; petals 5, linear-lanceolate, imbricate, at length recurved; disk none or minute; stamens 7-10 but usually only 1 fertile, the filaments connate at base, the anthers basifixed; gynoecium composed of a single carpel, the ovary obliquely obovoid, 1-celled, 1-ovuled, the style lateral, subulate, the stigma simple; fruit a reniform, laterally compressed drupe, borne on a large, pyriform hypocarp, the pyrene 1-seeded.

TYPE SPECIES: *Anacardium occidentale* L., the only original species.

DISTRIBUTION: Tropical America, with 8-15 species, one of which is widely cultivated.

1. *Anacardium occidentale* L. Sp. Pl. 383. 1753; Engl. in DC. Monogr. Phan. 4: 219. 1883, in Engl. & Prantl, Nat. Pflanzenfam. III. 5: 147. fig. 94. 1892; B. L. Field in Agr. J. Dept. Agr. Fiji 9 (3): 13. 1938; J. W. Parham, Pl. Fiji Isl. 175. 1964, ed. 2. 248. 1972; Purseglove, Trop. Crops, Dicot. 19. fig. 1. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 42. 1970; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 16. 1972; Ding Hou in Fl. Males. 1. 8: 421. fig. 6. 1978; Meijer in Rev. Handb. Fl. Ceylon 4: 8. 1983.

In Fiji the *cashew* is cultivated near sea level and has apparently not become naturalized; it seems to occur only as a small tree, the petals yellowish pink to reddish, the fruiting hypocarp yellow or red. Flowers have been noted between June and November.

TYPIFICATION: Several prior references were listed by Linnaeus.

DISTRIBUTION: Originally native in tropical America, the *cashew* is now widely cultivated throughout the tropics as a fruit tree. Its occurrence in Fiji is documented by only five collections.

LOCAL NAMES AND USES: No Fijian name is recorded for this species. Apparently the fleshy, edible, yellow or red *cashew apple* (the hypocarp, composed of the swollen pedicel and receptacle) is not prized in Fiji, and the plant is grown as a curiosity or a shade tree rather than for its commercially important seeds. It may have been first introduced by J. B. Thurston, being listed in his 1886 *Catalogue*.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Lautoka, Tothill 457. RA: Pasture Seed and Production Farm, Ndombuilevu, DA 9547. NAITASIRI: Nanduruloulou, DA 12255. VANUA LEVU: MATHUATA: Ndreketi Plantation, DA 16968; Seanggangga Farm, DA 13499.

4. *Spondias* L. Sp. Pl. 371. 1753; Seem. Fl. Vit. 51. 1865; Engl. in DC. Monogr. Phan. 4: 242. 1883; van Royen in Manual For. Trees Papua New Guinea 4: 39. 1964; Airy Shaw & Forman in Kew Bull. 21: 1. 1967; Ding Hou in Fl. Males. I. 8: 479. 1978; Meijer in Rev. Handb. Fl. Ceylon 4: 22. 1983.

Usually polygamodioecious trees, the leaves alternate, in our species imparipinnate and with chartaceous leaflet blades, these with an obvious intramarginal nerve and usually crenate-serrate; inflorescences terminal and distally axillary, often combined into a large, pyramidal panicle, the flowers small, usually 5-merous, sometimes 4-merous; calyx with small, spreading lobes; petals valvate, oblong-ovate, at length reflexed; disk annular or short-cupuliform, obvious, crenate; stamens usually 10, inserted below disk, the filaments subulate-filiform, the anthers medifixed; gynoeceum composed of 4 or 5 fused carpels slightly sunk into disk, each locule 1-ovuled, the styles distinct, stout, the stigmas spatulate; fruit a subglobose drupe with a carnosose mesocarp, the endocarp (of our species) lignose and bearing numerous, straight or curved, radiating processes, the locules often 5 (sometimes fewer), each 1-seeded.

TYPE SPECIES: *Spondias mombin* L., the only original species.

DISTRIBUTION: Pantropical, but mostly in America and Indo-Malesia, perhaps with 12-15 species. The recent review of the Old World species by Airy Shaw and Forman, in which the genus is considered more inclusive than by Engler, points out that the center of diversity is in southeastern tropical Asia, where ten species are recognized. One species, probably not indigenous but thoroughly naturalized, occurs in Fiji.

USEFUL TREATMENT OF GENUS: AIRY SHAW, H. K., & L. L. FORMAN. The genus *Spondias* L. (*Anacardiaceae*) in tropical Asia. Kew Bull. 21: 1-19. 1967.

1. *Spondias dulcis* Parkinson, J. Voy. Endeavour, 39. 1773; Forst. f. Pl. Esc. Ins. Oc. Austr. 33. 1786, Fl. Ins. Austr. Prodr. 34. 1786; Seem. Fl. Vit. 51. 1865; Engl. in DC. Monogr. Phan. 4: 246. 1883; Drake, Ill. Fl. Ins. Mar. Pac. 145. 1890; Engl. in Engl. & Prantl, Nat. Pflanzenfam. III. 5: 151. fig. 98, 99. 1892; Guillaumin in J. Arnold Arb. 14: 57. 1933; Christophersen in Bishop Mus. Bull. 128: 127. 1935; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 13: 46. 1942; Yuncker in Bishop Mus. Bull. 178: 77. 1943, in op. cit. 184: 48. 1945; Merr. in Pacific Sci. 8: 39. 1954; Yuncker in Bishop Mus. Bull. 220: 170. 1959; van Royen in Manual For. Trees Papua New Guinea 4: 39. fig. 15. 1964; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 148. 1972; J. W. Parham, Pl. Fiji Isl. ed. 2. 250. 1972; Meijer in Rev. Handb. Fl. Ceylon 4: 24. 1983.

Spondias cytherea Sonnerat, Voy. Ind. Orient. 3: 242. t. 123. 1782; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 96. 1948, Pl. Fiji Isl. 176. 1964; Airy Shaw & Forman in Kew Bull. 21: 10. fig. 2 (3, 4). 1967; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 43. 1970; St. John & A. C. Sm. in Pacific Sci. 25: 332. 1971; Ding Hou in Fl. Males. I. 8: 481. fig. 39. 1978.

Evia dulcis Commerson ex Bl. Mus. Bot. Lugd.-Bat. 1: 233. 1850; Seem. in Bonplandia 9: 255. 1861, Viti, 435. 1862.

Spondias dulcis var. *commersonii* Engl. in DC. Monogr. Phan. 4: 247. 1883.

In Fiji *Spondias dulcis* occurs from near sea level to about 350 m. in often dry forest, but it is also extensively cultivated. It is a tree 8-20 m. high, with yellow or white petals and with a bright yellow or orange fruit. From Fiji eastward in the Pacific flowers are found between August and December, and fruits during much of the year.

TYPIFICATION AND NOMENCLATURE: In their recent review, Airy Shaw and Forman indicate that they do not accept any of Parkinson's 1773 binomials as validly published, and therefore they adopt the binomial *Spondias cytherea*. However, many

students of Pacific plants believe that a few of Parkinson's names, beyond doubt in their interpretation, must be considered valid, as argued by Fosberg (in *Brittonia* **12**: 101-103. 1960). Merrill, in the 1954 reference cited above, considered Parkinson's notes on *S. dulcis* to be "his nearest approach to a botanical description." In the same year Merrill (in *Chron. Bot.* **14**: 360. *pl.* 91. 1954) reprinted Parkinson's unmistakable description and reproduced his unpublished plate deposited at BM. An appropriate LECTOTYPE for *S. dulcis* is "*Capt. Cook*" (BM) from Tahiti, probably a Banks and Solander voucher for Parkinson's plate. The description of *S. cytherea* and Sonnerat's plate were prepared from a cultivated plant in Mauritius, brought there from Tahiti by Commerson in 1768. An actual HOLOTYPE may well exist in the Commerson herbarium (P); at least a presumed ISOTYPE, indicated as a Sonnerat collection, is available at BM. In Engler's interpretation *S. dulcis* var. *commersonii* included the typical form of the species.

DISTRIBUTION: Although *Spondias dulcis* is widely distributed and pantropical in cultivation and also occurs in the Pacific in undisturbed areas, it was very probably an aboriginal introduction from an ultimately Indo-Malesian source. Airy Shaw and Forman consider that it is not known with certainty in the wild state. In spite of its abundance in Fiji, where it is grown in nearly every lowland village and is abundantly naturalized, it remains scarce in collections.

LOCAL NAMES AND USES: While *wi* is the widespread name in Fiji, the species is also known as *Otaheite apple* and *aura*. The succulent mesocarp makes the fruit a favorite, eaten either fresh or made into preserves; the bark has been noted as a toothache remedy, and the leaves are sometimes used to flavor meat. Seemann, in his 1865 account, discussed *Spondias dulcis* as the most agreeable fruit indigenous in Fiji, indicating that in village cultivation the fruits may attain a diameter of more than 9 cm. and may weigh more than a pound. However, fruits more than 5 cm. in diameter are unusual.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vatia, west of Tavua, *Degener 14975*. SERUA: Nambu-kelevu, upper Navua River, *DF 979 (Vakarewa 7)*. NAMOSI: Vicinity of Namuamua, *Gillespie 2962*. TAVEUNI: Somosomo, *Seemann 98*; Navakawau Village, *Weiner 71-7-28*. THITHIA: In lowland forest, *Bryan 559*.

5. DRACONTOMELON Bl. *Mus. Bot. Lugd.-Bat.* **1**: 231. 1850; Seem. *Fl. Vit.* **52**. 1865; van Royen in *Manual For. Trees Papua New Guinea* **4**: 19. 1964; Ding Hou in *Fl. Males.* **1**: 468. 1978.

Dracontomelum Miq. *Fl. Ned. Ind. Suppl.* 524, orth. var. 1861; Engl. in *DC. Monogr. Phan.* **4**: 250. 1883.

Trees, the leaves alternate, imparipinnate, the leaflet blades chartaceous, entire, bearing domatia, without an obvious intramarginal nerve; inflorescences axillary or terminal, paniculiform, the flowers comparatively large, ♂, 5-merous; sepals imbricate, essentially free; petals connivent or valvate proximally, imbricate distally, at length recurved; disk broadly cupuliform, crenulate; stamens 10, inserted outside disk, about as long as petals, the filaments slender, the anthers medifixed; gynoecium composed of 5 connate carpels (some often abortive), each locule 1-ovuled, the styles free at base, connate distally, the stigma 5-angled; fruit a subglobose drupe, drying oblate, often showing scars of separate style bases, the mesocarp carnose, the pyrene flattened, the locules 5 or fewer, each 1-seeded.

LECTOTYPE SPECIES: Three species were originally included without question by Blume; *Dracontomelon mangiferum* (Bl.) Bl. is listed as the type species by Tardieu-Blot (in *Fl. Cambodge, Laos et Vietnam* **2**: 143. 1962), but ING (1979) does not indicate

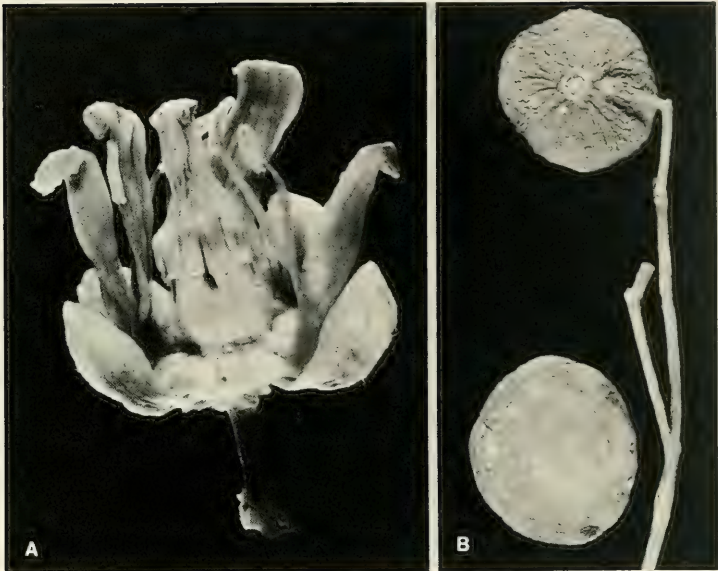


FIGURE 97. *Dracontomelon vitiense*; A, flower, with 1 sepal, 1 petal, and 3 stamens removed, $\times 8$; B, portion of infructescence and dried fruits, proximal and distal surfaces, $\times 1$. A from Smith 943, B from Smith 7951.

a lectotype species. Ding Hou (1978) considers *D. mangiferum* and its basionym *Poupartia mangifera* Bl. to be illegitimate names referable to *D. dao* (Blanco) Merr. & Rolfe.

DISTRIBUTION: Southeastern Asia and Malesia eastward to Tonga and Samoa, probably with eight-ten species, one of which occurs in the eastern part of the generic range.

1. *Dracontomelon vitiense* Engl. in DC. Monogr. Phan. 4: 253, as *Dracontomelum* v. 1883; J. W. Parham, Pl. Fiji Isl. 176. 1964, ed. 2. 249. 1972. FIGURES 97, 100A.

Dracontomelon sylvestre sensu A. Gray, Bot. U. S. Expl. Exped. 1: 374. 1854; Seem. in Bonplandia 9: 255. 1861, Viti, 435. 1862, Fl. Vit. 52. 1865; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 13: 47. 1942; non Bl. *Dracontomelum sylvestre* sensu Drake, Ill. Fl. Ins. Mar. Pac. 145. 1890; non Bl.

Dracontomelum vitiense Engl. ex Guillaumin in J. Arnold Arb. 12: 242. 1931, in op. cit. 14: 57. 1933; Christophersen in Bishop Mus. Bull. 128: 127. 1935.

This presumably indigenous species occurs in Fiji at elevations from near sea level to about 300 m., in dry or open forest or in cultivation, as a tree 8-20 m. high with a trunk as much as 90 cm. in diameter. The petals are white and the fruit, up to 3.5 cm. or perhaps more in diameter, is green or yellow and has a yellowish pulp. It is usually in flower between January and March and in fruit from June to August.

TIPIFICATION: In the original protologue Engler cited *Seemann 99* (G-DC, K, W) and *Whitmee 110* (K) from Samoa. In view of the specific epithet and the fact that Seemann's first set is at Kew, I here designate as LECTOTYPE *Seemann 99* (K, ISOLECTO-

TYPE also at BM). Neither Seemann nor Engler gave a locality within Fiji, but the Kew sheet was described by Seemann as "Mathuata, October 1860." From his book *Viti* one learns that Seemann spent October 12-15 travelling along the Mathuata coast in the *Paul Jones*, calling at Nukumbati Island (Oct. 12), Mathuata Island (Oct. 14), Nanduri (Oct. 14), and "Namuka" (probably Namukalau Island) (Oct. 15). As *Dracontomelon vitiense* is often found in villages, Seemann's specimens could have been obtained at any of those localities.

DISTRIBUTION: New Hebrides, Fiji, Tonga, and Samoa. One may be inclined to wonder whether this species could have been an aboriginal introduction, but it does not appear west of the New Hebrides and therefore it is more probably indigenous, recognized as a poor substitute for *Spondias dulcis*. In spite of its frequency in villages, not many Fijian collections are available.

LOCAL NAMES AND USES: *Tarawau*, *tarawau ndina*, and *tarau* are used for the species, of which the fruit has a more or less edible mesocarp, sometimes used medicinally. In his 1865 discussion Seemann remarks that the *tarawau* has a "tough insipid fruit, only palatable to the natives," and he also details some interesting superstitions once held about the plant.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Vicinity of Mbelo, near Vatukarasa, *Degener 15263*. REWA: *U. S. Expl. Exped.*; Suva, DA, Jan. 1950, DA 7001, *MacDaniels 1022*. MBENGA: Savusavukalou, *Weiner 185*. KORO: Eastern slope of main ridge, *Smith 943*. NGAU: Hills east of Herald Bay, on slopes of Mt. Vonda and toward Waikama, *Smith 7951*. VANUA LEVU: MATHUATA: Saivou Village, Ndreketi River, *Berry 26*. THAKAUNDOVE: Nathula Village, Sangani Tikina, *Howard 123*. FIJI without further locality, *Horne 489*, DA 1841.

The relationship of *Dracontomelon vitiense* is with the widespread Indo-Malesian *D. dao* (Blanco) Merr. & Rolfe (India and southern China to the Solomon Islands as interpreted by Ding Hou, 1978), but it seems readily distinguished by its longer petiolules (4-8 mm. long) and somewhat smaller flowers. The buttresses characteristic of *D. dao* (Ding Hou, 1978, *fig. 32*) are comparatively inconspicuous in *D. vitiense*.

6. PLEIOGYNIUM Engl. in DC. Monogr. Phan. 4: 255. 1883; van Royen in Manual For.

Trees Papua New Guinea 4: 32. 1964; Ding Hou in Fl. Males. 1. 8: 474. 1978.

Trees, often dioecious, the leaves alternate, imparipinnate, the leaflet blades chartaceous, essentially entire, without an intramarginal nerve; inflorescences axillary, paniculate, the flowers small, usually 5-merous; calyx deeply 5(4- or 6)-lobed; petals 4-6, usually 5, imbricate; disk annular-pulvinate, crenulate; stamens 9-14 but often 10 in ♂ flowers (staminodes to 14 in ♀ flowers), inserted below disk, the filaments filiform-subulate, the anthers versatile; gynoecium composed of 5-12 connate carpels, the ovary subglobose-oblate, with 5-12 locules, each 1-ovuled, the styles short, divergent from distal margin of ovary, the stigmas spatulate; fruit a broadly turbinate drupe, proximally angled, the mesocarp woody, the locules 5-12, each 1-seeded.

TYPE SPECIES: *Pleiogygium solandri* (Benth.) Engl. (*Spondias solandri* Benth.) = *P. timoriense* (DC.) Leenh.

DISTRIBUTION: From the Philippines and Lesser Sunda Islands to Australia and eastward to Tonga; cultivated in the Cook Islands, Hawaii, and elsewhere. Two or three species are recognized (Ding Hou, 1978), but perhaps the limits of *Pleiogygium timoriense* should be reconsidered. Two species are here noted as present in Fiji.

KEY TO SPECIES

- Young parts, branchlets, and leaves glabrous, the petiole and rachis rarely evanescently puberulent with hairs less than 0.1 mm. long. 1. *P. timoriense*
 Young parts, branchlets distally, petioles, rachis, and lower surfaces of leaflet blades copiously and persistently pilose with hairs to 0.5 mm. long; inflorescence branches and bracts similarly pilose. 2. *P. hapalum*



FIGURE 98. A, *Pleio gynium timoriense*; dried fruits, distal, lateral, and proximal surfaces, $\times 2$. B, *Pleio gynium hapalum*; distal portion of branchlet, with foliage and inflorescences, $\times 1/3$. A from Smith 7752. B from Smith 1940.

1. *Pleio gynium timoriense* (DC.) Leenh. in *Blumea* 7: 159. 1952; van Royen in *Manual For. Trees Papua New Guinea* 4: 32. fig. 12. 1964; J. W. Parham, *Pl. Fiji Isl.* ed. 2. 249. 1972; Ding Hou in *Fl. Males.* 1. 8: 474. fig. 34. 1978. FIGURES 98A, 100B.

Icica timoriense DC. *Prodr.* 2: 78. 1825.

Spondias solandri Benth. *Fl. Austral.* 1: 492. 1863.

Pleio gynium solandri Engl. in DC. *Monogr. Phan.* 4: 255. t. 7. fig. 1-10. 1883, in Engl. & Prantl, *Nat. Pflanzenfam.* III. 5: 151. fig. 97, E, F. 1892; A. C. Sm. in *Bishop Mus. Bull.* 141: 87. 1936; B. E. V. Parham in *Agr. J. Dept. Agr. Fiji* 10: 116. 1939; Yuncker in *Bishop Mus. Bull.* 220: 171. 1959; J. W. Parham, *Pl. Fiji Isl.* 176. 1964.

In Fiji *Pleio gynium timoriense* occurs from near sea level to about 970 m. in dense or thin forest, secondary forest, beach thickets, and along rocky shores, as a tree 3-30 m. high with a trunk sometimes to 2 m. in diameter. Its petals and filaments are pale yellow to white, its anthers yellow, and its fruits when mature red to purple and to 2.5 cm. in diameter. Flowers and fruits are found throughout the year.

TYPIFICATION AND NOMENCLATURE: De Candolle merely cited a specimen from Timor as "V. s. comm. a Mus. Par." (G-DC HOLOTYPE). As *Spondias solandri* Bentham cited *Banks & Solander*, from the Endeavour River, and R. Brown, from several localities; from the epithet one may perhaps take *Banks & Solander* (BM) as the LECTOTYPE. The two concepts, as pointed out by Leenhouts, are correctly combined.

DISTRIBUTION: From Timor and other parts of Malesia through Queensland and into the Pacific to Fiji and Tonga; infrequently cultivated elsewhere. In Fiji the species is common; I have examined about 40 collections from nine islands, but it is to be expected on many other islands.

LOCAL NAMES AND USE: The species is well known to Fijians and passes under several names: *manawai*, *manui*, *ndumbundumbu*, *tarawau tangane*, *tarawau kei rakaka*, *vesinda*, *tolo*, and *totowiwi*. It is a timber tree, the wood being prized for canoes in Lau and for houseposts and beams throughout the archipelago. The fruit seems to be attractive to birds.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Nangua, *St. John 18120*. VITI LEVU: MBA: Mt. Nukulevu, *DA 14826*; vicinity of Nandarivatu, *Gillespie 4190*. SERUA: Mt. Tuvutau, *DA 15526*; Ndeumba Beach, *DA 13219*. NAITASIRE: N. T. C. Farm, *DA 9652*. TAILEVU: Waindara Creek, *DA 645*. REWA: Mt. Korombamba, *Gillespie 2347*. OVALAU: *Graeffe 1553*. NGAU: Hills east of Herald Bay, inland from Sawaieke, *Smith 7752, 7826*. VANUA LEVU: MBUA: Above Thongea, Wainunu River, *DA 15783*. MATHUATA: Ndreketi River, *Berry 37*; southern slopes of Mt. Numbuiloa, east of Lambasa, *Smith 6548*. THAKAUNDROVE: Eastern drainage of Yanawai River, *Degener & Ordonez 14110*; Navonu Ridge, Natewa Peninsula, *DA 16887*. MOALA: North coast, *Smith 1399*. VANUA MBALAVU: Northern limestone section, *Smith 1499*. KAMBARA: On limestone, *Smith 1300*. FULANGA: On limestone, *Smith 1184*.

2. ***Pleiogynium hapalum*** A. C. Sm. in Contr. U. S. Nat. Herb. 37: 76. 1967; J. W. Parham, Pl. Fiji Isl. ed. 2. 249. 1972. FIGURES 98B, 99A, 100C.

Rhus tahitensis sensu Seem. in Bonplandia 9: 255. 1861; non Guillemín.

Rhus taitensis sensu Seem. Viti, 435. 1862, Fl. Vit. 49. 1865; non Guillemín.

This endemic *Pleiogynium* occurs in usually dense forest at elevations of 50–800 m., as an often slender tree 5–20 m. high with a trunk to 30 cm. (or more) in diameter. Its petals and filaments are pale to greenish yellow, its anthers brighter yellow, and its mature fruits red or purple. Flowers have been obtained between June and November and fruits in April and August.

TYPIFICATION: The type is *Smith 8958* (US 2191567 HOLOTYPE; many ISOTYPES), collected Oct. 15, 1953, in hills east of the Wainikoroiluva River near Namuamua, Namosi Province, Viti Levu.

DISTRIBUTION: Apparently endemic to Fiji and thus far known only from the 15 cited specimens from the two largest islands.

LOCAL NAME AND USE: The only recorded name is *totowiwi*, and the species is considered a suitable timber tree.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vunanamo, *DA 14790*; Nandarivatu, *Gillespie 3189*. NANDRONGA & NAVOSA: Yavu logging area, *Berry 90*; vicinity of Nandrau, *Berry 65, 76*. NAMOSI: Hills bordering Wainavindrau Creek, vicinity of Wainimakutu, *Smith 8531*; northern slopes of Korombasambasanga Range, in drainage of Wainavindrau Creek, *Smith 8699*; Nanggarawai Village, *Gillespie 3227*; vicinity of Namuamua, *Gillespie 2977, 3058*. NAITASIRE: Nanduna, *DA 2624*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7164*. VITI LEVU without further locality, *Seemann 96*. VANUA LEVU: THAKAUNDROVE: Hills west of Korotasere, Natewa Bay region, *Smith 1940*.

7. ***Harpephyllum Bernhardi*** ex Krauss in Flora 27: 349. 1844; Engl. in DC. Monogr. Phan. 4: 282. 1883.

Diocious trees, the leaves alternate, imparipinnate, the rachis narrowly winged distally, the leaflet blades coriaceous, obliquely lanceolate; inflorescences axillary, paniculate, the flowers 5-merous; calyx lobes and petals imbricate; stamens 10; ovary with free styles; fruit an oblong-obovoid drupe, the mesocarp thin, acid, the endocarp woody, with 4 locules, the 2 larger ones each 1-seeded.

TYPE SPECIES: *Harpephyllum caffrum* Bernhardt ex Krauss.

DISTRIBUTION: A genus of southern Africa, often considered monotypic.

1. *Harpephyllum caffrum* Bernhardi ex Krauss in Flora 27: 349. 1844; Engl. in DC. Monogr. Phan. 4: 283. 1883; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 96. 1948, in op. cit. 29: 32. 1959.

The dark red fruit of this occasionally cultivated plant has an edible, thin, subacid mesocarp.

TYPEIFICATION: The type is apparently *Gueinzium* (w HOLOTYPE), from Natal, South Africa.

DISTRIBUTION: Southern Africa, and now cultivated elsewhere for its fruit and as an ornamental curiosity.

No available herbarium vouchers support the present occurrence of the *kaffir plum* in Fiji, and it is not included in Parham's *Plants of the Fiji Islands*. However, as recently as 1959 it was growing in the Botanical Gardens at Suva; it is here listed because it may still be in cultivation in Fiji.

8. *PISTACIA* L. Sp. Pl. 1025. 1753; Engl. in DC. Monogr. Phan. 4: 284. 1883; Ding Hou in Fl. Males. I. 8: 547. 1978.

Dioecious trees or shrubs, the leaves alternate, in our species imparipinnate and with lanceolate, chartaceous leaflet blades; inflorescences racemose or paniculate, the flowers subtended by a bract and 2 prophylls; sepals 1-5; petals lacking; stamens 3-5 in ♂ flowers, the filaments connate to the minute disk, the anthers basifixed; ovary 1-locular, the style short, 3-branched; fruit an obliquely ovoid or rounded drupe with a single compressed seed.

LECTOTYPE SPECIES: *Pistacia vera* L. (vide M. L. Green, Prop. Brit. Bot. 191. 1929).

DISTRIBUTION: A genus of about ten species distributed from the Mediterranean area to eastern Asia and Malesia, and also occurring from the southwestern United States to Guatemala. One species has been cultivated in Fiji.

1. *Pistacia chinensis* Bunge, Enum. Pl. China Bor. Coll. 15. 1833 (preprint from Mém. Sav. Etr. Acad. Pétersb. 2: 89. 1835); Engl. in DC. Monogr. Phan. 4: 291. 1883; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 96, as *Pistachia c.* 1948; Ding Hou in Fl. Males. I. 8: 547. 1978.

This sometimes cultivated species is often used as a stock for budding the commercially important *Pistacia vera* L. However, neither species is now likely to be found in Fiji.

TYPEIFICATION: The type is *Bunge* (HOLOTYPE probably at LE; probable ISOTYPE at G-DC as *Bunge 84*), collected in northern China.

DISTRIBUTION: China, and elsewhere in cultivation.

The *Chinese pistachio* is here listed because it was noted as growing in the Suva Botanical Gardens in 1948, presumably as an ornamental curiosity. It may not have persisted in cultivation in Fiji.

9. *SCHINUS* L. Sp. Pl. 388. 1753; Engl. in DC. Monogr. Phan. 4: 331. 1883.

Dioecious trees or shrubs, the leaves (in our species) alternate, imparipinnate, with the rachis narrowly winged and with subcoriaceous leaflet blades; inflorescences axillary, compactly paniculiform; flowers 4- or 5-merous, the calyx lobes and petals imbricate; stamens or staminodes 10 (or 8), attached at outer base of lobed disk, the anthers medifixed; gynoeceum 3-carpellate but ovary 1-celled, 1-ovuled, the ovule pendulous from near apex of locule, the styles 3, united proximally, with free stigmas; fruit a small drupe, the mesocarp thin and resinous, the endocarp bony, the seed solitary and sublentiform.

LECTOTYPE SPECIES: *Schinus molle* L. (vide Hitchcock, Prop. Brit. Bot. 153. 1929), one of Linnaeus's six original species.

DISTRIBUTION: Southern South America to Mexico, with about 30 species, one of which is sometimes cultivated and naturalized in paleotropical areas.

USEFUL TREATMENTS OF GENUS: BARKLEY, F. A. *Schinus* L. *Brittonia* 5: 160-198. 1944. BARKLEY, F. A. A study of *Schinus* L. *Lilloa* 28: 5-110. 1957.

1. *Schinus terebinthifolius* Raddi in Mem. Mat. Fis. Soc. Ital. Sci. Modena, Pt. Mem. Fis. 18: 399. 1821; Engl. in DC. Monogr. Phan. 4: 334. 1883; Barkley in *Brittonia* 5: 189. fig. 16. 1944; J. W. Parham, Pl. Fiji Isl. ed. 2. 249. 1972.

This sometimes cultivated species seems to be a recent introduction into Fiji; its inconspicuous flowers have been noted in July and its red fruits in July and November.

TYPIFICATION: The type was presumably collected by Raddi in Brazil. Of the several varieties of the species recognized by Barkley, our material seems to fall well within var. *terebinthifolius*.

DISTRIBUTION: South America, probably indigenous in eastern and southern Brazil, but now widespread in cultivation and often naturalized. In Fiji it is still infrequent and has not vigorously established itself as in Hawaii and elsewhere.

LOCAL NAME AND USE: Presumably introduced as a potential ornamental, the species has been noted as *warui*, because of its peppery fruit. The name *Christmas berry* (used in Hawaii) is perhaps not appropriate in Fiji.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Singatoka Experimental Farm (Agricultural Station, Nathotholevu) and vicinity, in nursery and naturalized on cultivated land, DA 5976. 8300. 17430.

10. *Rhus* L. Sp. Pl. 265. 1753; Seem. Fl. Vit. 49, p. p. 1865; Engl. in DC. Monogr. Phan. 4: 371. 1883; van Royen in Manual For. Trees Papua New Guinea 4: 34. 1964; Ding Hou in Fl. Males. I. 8: 534. 1978.

Dioecious or polygamodioecious trees or shrubs or lianas, the leaves (in our species) alternate, imparipinnate, with the rachis subterete to narrowly winged and with subcoriaceous leaflet blades; inflorescences paniculiform, axillary or subterminal, the flowers small, 5-merous; calyx deeply lobed, the lobes and petals imbricate; disk annular or cupuliform, lobed; stamens (or staminodes) 5, attached at outer base of disk, the anthers dorsally affixed near base; gynoecium 3-carpellate but ovary 1-celled, 1-ovuled, the ovule pendulous from a basal funicle, the styles 3, short, free from base in our species; fruit a small, subglobose drupe, the mesocarp thin and resinous, the endocarp bony, laterally compressed, ovoid to reniform, coarsely verrucose in our species, the seed solitary.

LECTOTYPE SPECIES: *Rhus coriaria* L. (vide Britton & Brown, Ill. Fl. N. U. S. ed. 2. 2: 481. 1913), one of Linnaeus's twelve original species.

DISTRIBUTION: A genus of about 250 species, if broadly interpreted, primarily of subtropical and warm temperate areas of both hemispheres but extending into colder regions. One species is indigenous in Fiji.

1. *Rhus simarubifolia* A. Gray, Bot. U. S. Expl. Exped. 1: 367, as *R. smarubaefolia*. 1854, Atlas, pl. 44, B. 1856; J. W. Parham, Pl. Fiji Isl. ed. 2. 249. 1972.

FIGURE 99D & E.

Rhus simarubifolia A. Gray ex Seem. in Bonplandia 9: 255. 1861, Viti, 435. 1862, Fl. Vit. 49. 1865; Engl. in DC. Monogr. Phan. 4: 450. 1883; Drake, Ill. Fl. Ins. Mar. Pac. 145. 1890; Gibbs in J. Linn. Soc. Bot. 39: 144. 1909; Turrill in op. cit. 43: 19. 1915; J. W. Parham, Pl. Fiji Isl. 176. 1964

A tree 5–14 m. high with a trunk to 50 cm. in diameter, occurring from near sea level to about 900 m. in open or thin forest or on reed-covered hillsides. The petals and filaments are white, the anthers yellow, and the fruits black. Flowers have been obtained between May and December, fruits between November and March.

TIPIFICATION: The type is *U. S. Expl. Exped.* (US 19956 HOLOTYPE), collected in 1840 in Mathuata Province, Vanua Levu.

DISTRIBUTION: Fiji, the New Hebrides, and probably also Tonga and Niue. About 30 collections of *Rhus simarubifolia* are available from four Fijian islands, but the species certainly occurs on other islands.

LOCAL NAMES AND USES: Although *manawi* in Fiji generally refers to this species, the names *tarawau* and *totowiwi* (more strictly applicable to other anacardiaceous genera) have also been recorded. The leaves are the source of a black dye, sometimes applied to hair; the species is also reputed to have undefined medicinal properties.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Naruarua Gulch, near Mbatinaremba, *St. John 18067*. VITI LEVU: MBA: Vicinity of Nandarivatu, *Gibbs 782*, *im Thurn 293*. SERUA: Vicinity of Namboutini, *DA L.22302 (DF 94)*. RA: Vicinity of Rewasa, near Vaileka, *Degener 15497*. NAITASIRE: Naitauvoli or Nuku, *DA 7009*. REWA: Mt. Korombamba, *DA 1274*. VANUA LEVU: MBUA: Ndavoka, Navakasinga district, *H. B. R. Parham 444a*. MATHUATA: *Seemann 95*; Nanduri, *Tothill 440*; southern base of Mathuata Range, north of Natua, *Smith 6792*; vicinity of Lambasa, *Greenwood 463*. THAKAUNDROVE: Above Nainggangi, Navakathimbi Creek, *DA 15708*. MOALA: Summit ridge, *Bryan 344*.

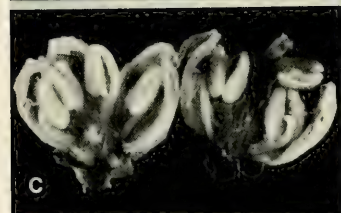
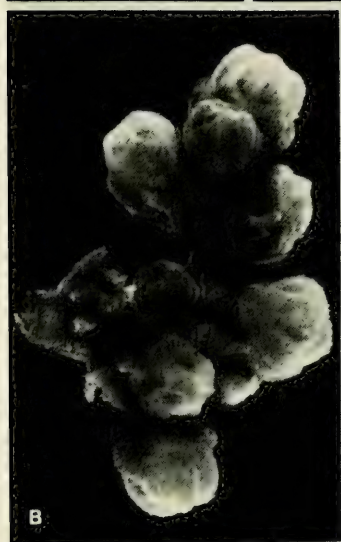
A species related to *Rhus simarubifolia* is *R. taitensis* Guillemin (in *Ann. Sci. Nat. Bot.* II. 7: 361. 1837, repr. *Zephyr. Tait.* 67. 1838), typified by Bertero and Moerenhout material from Tahiti. Polynesian specimens of the latter have the leaflet blades more numerous, comparatively long, and often with the costa pilose beneath, in contrast to those of *R. simarubifolia*. While the available material from the Societies to Samoa seems clearly to represent Guillemin's species, I believe that some of the specimens from Tonga and Niue (cf. Yuncker in *Bishop Mus. Bull.* 178: 1943, in op. cit. 220: 171. 1959; Sykes in *New Zealand Dept. Sci. Indust. Res. Bull.* 200: 42. 1970) are better placed in *R. simarubifolia*.

Our species is placed by Engler in sect. *Melanocarpae* Engl. (in *Bot. Jahrb.* 1: 380. 1881, in *DC. Monogr. Phan.* 4: 375. 1883), which incorporates *Melanococca* Bl. (*Mus. Bot. Lugd.-Bat.* 1: 236. 1850 or 1851). If the genus *Rhus* should be more narrowly restricted, the Pacific material would fall into Blume's genus. However, I doubt if all the material of this immediate relationship should be referred to a highly variable *R. taitensis*. Ding Hou (in *Fl. Males.* I. 8: 537. 1978) has taken *R. taitensis* to extend from the Philippines and Java to the Society Islands; his concept includes both *R. simarubifolia* and the type species of *Melanococca*, *M. tomentosa* Bl. If such a broad specific concept is adopted, it may be expected that future students of *Rhus* (sensu lat.) will suggest infraspecific taxa.

Engler (in *DC. Monogr. Phan.* 4: 451. 1883) reduced *Rhus taitensis* to varietal status under *R. simarubifolia*, a procedure not nomenclaturally permissible because *taitensis* is the older epithet. If it is eventually decided that the two concepts are conspecific, Guillemin's name must be retained.

Some specimens of *Rhus simarubifolia* are suggestive of *Schinus terebinthifolius*, but the former is distinguishable in having only five stamens or staminodes, in its free styles, and in its usually reniform and verrucose endocarp.

FIGURE 99. A, *Pleiogynium hapalum*; flowers, $\times 8$. B & C, *Semecarpus vitiensis*; B, ultimate parts of δ inflorescence, with young flowers, $\times 8$; C, σ flowers, 6-merous (left) and 5-merous (right), each with 2 petals and 2 stamens removed, $\times 8$. D & E, *Rhus simarubifolia*; D, distal portion of branchlet, with foliage and inflorescences, $\times 1/3$; E, flowers, $\times 8$. A from *Smith 8958*, B from *Smith 9676*, C from *DA 14914*, D & E from *St. John 18067*.





11. *SEMECARPUS* L. f. *Suppl. Pl.* 25, 182. 1782; Engl. in DC. *Monogr. Phan.* 4: 472. 1883; A. C. Sm. in J. Arnold *Arb.* 36: 281. 1955; van Royen in *Manual For. Trees Papua New Guinea* 4: 37. 1964; Ding Hou in *Fl. Males. I.* 8: 499. 1978; Meijer in *Rev. Handb. Fl. Ceylon* 4: 8. 1983.

Oncocarpus A. Gray in *Proc. Amer. Acad. Arts* 3: 51. 1853, *Bot. U. S. Expl. Exped. I:* 364. 1854; Seem. *Fl. Vit.* 50. 1865.

Diocious or polygamodioecious trees or shrubs, with caustic, black-drying juice, the leaves alternate, simple, the blades entire, coriaceous in our species and with copious free reticulate venation; inflorescences axillary but often combined into a terminal panicle, the flowers small, 5(4- or 6)-merous; calyx cupuliform, with short, usually imbricate lobes; petals oblong, usually narrowly imbricate, at length recurved; disk intrastaminal, annular to cupuliform, usually copiously pilose; stamens inserted at base of disk, the filaments filiform, the anthers medifixed; gynoecium 3-carpellate but ovary 1-celled, with a solitary pendulous ovule, the styles 3, short, divaricate; fruit an irregularly lobed ovoid drupe, borne on a conspicuous, fleshy, turbinate or cupuliform hypocarp formed by the enlarged receptacle and pedicel apex, the mesocarp resiniferous, the endocarp crustaceous and irregular.

TYPE SPECIES: *Semecarpus anacardium* L. f. The synonym *Oncocarpus* is typified by *O. vitiensis* A. Gray (= *Semecarpus vitiensis*), published in 1853 as part of a descriptio generico-specifica.

DISTRIBUTION: Southeastern Asia through Malesia to Australia and eastward to Fiji and Tonga, with 60-80 species, one of which is indigenous in Fiji.

1. *Semecarpus vitiensis* (A. Gray) Engl. in DC. *Monogr. Phan.* 4: 483. 1883; Drake, Ill. *Fl. Ins. Mar. Pac.* 146. 1890; A. C. Sm. in J. Arnold *Arb.* 36: 281. 1955; J. W. Parham, *Pl. Fiji Isl.* 176. 1964, ed. 2. 249. *fig.* 73. 1972.

FIGURES 99B & C, 100D & E.

Oncocarpus vitiensis A. Gray in *Proc. Amer. Acad. Arts* 3: 52. 1853, *Bot. U. S. Expl. Exped. I:* 365. 1854, *Atlas, pl.* 43. 1856; Seem. in *Bonplandia* 9: 255. 1861, in op. cit. 10: 296. 1862, *Fl. Vit.* 50. 1865.

Oncocarpus atra Seem. *Viti*, 435, sensu spec. vit., non sensu typi. 1862.

A tree 5-30 m. high, with pale yellow or brown, irritating latex, occurring from near sea level to about 900 m. in dense or dry forest or on forest edges; the calyx is brown and the petals are white. Flowers and fruits do not appear seasonal.

TYPIIFICATION AND NOMENCLATURE: The type is *U. S. Expl. Exped.* (us 19974 HOLOTYPE), collected in 1840 at Mbua Bay, Mbua Province, Vanua Levu. Gray also listed Rewa, Viti Levu, but possibly the Exploring Expedition collectors merely observed it there and did not preserve a specimen. *Oncocarpus atra* (sic) (Forst. f.) Seem., cited above, is a nomenclaturally correct combination for the New Caledonian *Rhus atrum* (sic) Forst. f., now known as *Semecarpus ater* (Forst. f.) Vicill., but the listed specimens were misidentified.

DISTRIBUTION: Fiji and Tonga. My 1955 record of termination of the range of *Semecarpus* in Fiji is erroneous, as *Yuncker 15574*, from 'Eua, Tonga, certainly represents *S. vitiensis*. This number was cited by Yuncker as *Planchonella membranacea* (Sapotaceae) in *Bishop Mus. Bull.* 220: 211. 1959, on the basis of my erroneous identification. The species is frequent in Fiji, where it is known from about 40 collections.

FIGURE 100. A, *Dracontomelon vitiense*; lower leaflet blade surface along costa, showing domatia, $\times 10$. B, *Pleiogynium timoriense*; lower leaflet blade surface along costa, showing domatia, $\times 10$. C, *Pleiogynium hapalum*; lower leaflet blade surface along costa, showing inconspicuous domatia, $\times 10$. D & E, *Semecarpus vitiensis*; D, distal portion of branchlet, with foliage and an inflorescence, $\times 1/3$; E, portion of infructescence with dried fruits, $\times 2$. A from *Smith 943*, B from *Smith 7826*, C from *Smith 8531*, D from *Smith 9676*, E from *Smith 7533*.

LOCAL NAMES AND USES: This infamous species is known in Fiji as *kaukaro*, but the names *malawathi* and *mbausomi* have also been recorded, perhaps in error. In spite of the fact that the leaves, bark, and wood contain a poisonous substance causing violent dermatitis, *Semecarpus vitiensis* is utilized as a timber tree. An amusing (except to the victim) account of the disastrous effects of contact with the fresh wood was detailed by Seemann in his 1865 treatment.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, *Gillespie 3724*; valley of Nggaliwana Creek, north of Navai, *Smith 5340*. SERUA: Navau Creek, upper Navua River, *Howard 8*; hills between Wainngere and Waisee Creeks, between Ngaloa and Wainiyambia, *Smith 9676*. NAMOSI: Wainandoi River, *DF 492 (Damanu 131)*. NAITASIRI: Tholo-i-suva, *DA 12212 (Watkins 730)*. TAILEVU: Waimaro River, *DA 13647*. KANDAVU: Slopes of Mt. Mbuke Levu, *DA 14914*. OVALAU: Hills west of Lovoni Valley, on ridge south of Mt. Korolevu, *Smith 7533*. VANUA LEVU: MATHUATA: Seanggangga area, *DA 13628*; northwestern slopes of Mt. Numbuloa, east of Lambasa, *Smith 6540*. THAKAUNDRIVE: Mountains near Waiwai, *Horne 629*; Mbutha Bay area, Natewa Peninsula, *Howard 270*. KAMBARA: *Tothill 88*. FIJI without further locality, *Seemann 94*, *Storck 881*, *Horne 325*.

Possible extension of the range of *Semecarpus vitiensis* to the New Hebrides is suggested by the specimens referred by Guillaumin to "*Semecarpus* sp. nov.?" (in *J. Arnold Arb.* 12: 244. fig. 3. 1931), as well as by more recent New Hebridean collections. However, New Hebridean specimens usually have the leaf blades more extended distally into a blunt tip than those of Fijian specimens, in which the leaf blade apex is rounded or retuse to obtuse. The obconical hypocarp of mature Fijian fruits in dried condition rarely exceeds 8 mm. in length and 10 mm. in apical diameter, whereas in the New Hebridean fruits the dried hypocarp often measures 15–25 mm. in length and apical diameter. Without further study, therefore, I hesitate to ascribe *S. vitiensis* to the New Hebrides, where the material of this relationship should perhaps be compared with the New Caledonian *S. ater* (Forst. f.) Vieill.

FAMILY 134. BURSERACEAE

BURSERACEAE Kunth in *Ann. Sci. Nat.* 2: 346. 1824.

Trees or shrubs, usually dioecious, with prominent resiniferous ducts in bark, usually stipulate (but our species of *Canarium* stipulate); leaves alternate or infrequently opposite, imparipinnate or trifoliolate, rarely unifoliolate; inflorescences axillary, often crowded at ends of branchlets and pseudoterminal, or terminal, paniculate, less often racemose or spicate, bracteate; flowers ♂ or ♀, infrequently ♂, hypogynous or rarely perigynous, actinomorphic, 3–5-merous; calyx deeply or shallowly lobed, the lobes usually valvate, sometimes essentially free; petals free, usually valvate, sometimes irregularly imbricate, seldom lacking; disk well developed, usually intrastaminal, annular to cupuliform; stamens 6–10 (sometimes 3–5) (usually present but slightly reduced or staminodial in ♀ flowers), the filaments distinct or rarely connate, sometimes adnate to disk, the anthers introrse, usually dorsifixed near base, dehiscing by longitudinal slits; gynoecium composed of (2–) 3–5 carpels united in a compound ovary (often present as a pistillode in ♂ flowers), the ovules axile, descending, (1 or) 2 per locule, collateral, epitropous, the style simple, usually short, the stigma lobed or globular; fruits drupaceous (rarely tardily dehiscent), with 1–5 pyrenes each with a single seed or with 1 plurilocular pyrene, the pericarp dry to fleshy, the endocarp crustaceous or stony to papyraceous, the endosperm essentially none, the cotyledons usually lobed or cleft, the embryo straight or curved.

DISTRIBUTION: Pantropical, with about 17 genera and 500–600 species. Many species produce gums and resins, and some are timber trees. Two genera have indigenous species in Fiji.

USEFUL TREATMENTS OF FAMILY: ENGLER, A. *Burseraceae*. Engl. & Prantl, *Nat. Pflanzenfam.* ed. 2. 19a: 405–456. 1931. LEENHOUTS, P. W. *Burseraceae*. *Fl. Males.* 1. 5: 209–296. 1956.

A third genus which might be expected to occur in Fiji is *Garuga* (cf. C. Kalkman: Revision of the genus *Garuga* Roxburgh; in *Blumea* 7: 459-472. 1953). *Garuga floribunda* Dec. var. *floribunda* occurs from the Malay Peninsula eastward to the Solomons and New Hebrides, and also in Tonga and Samoa. If indeed its indigenous range extends into western Polynesia, its absence from Fiji can be explained only as a vagary of collecting and it must definitely be anticipated in future collections. In Tonga (where a synonym is *Garuga pacifica* Burkill in J. Linn. Soc. Bot. 35: 30. 1901; Crosby 291, κ HOLOTYPE) it is frequent and its timber is used in general construction work. Yuncker (in Bishop Mus. Bull. 220: 155. 1959) does not comment on its indigenousness. Sykes (in *Allertonia* 2: 348. 1981) considers the species to have been introduced into Tonga, this viewpoint being supported by G. P. Buelow (personal communication), who states that *Garuga* is commonly planted near villages, although it is widely naturalized. Its bark is said to have medicinal uses and its fruits are edible.

In Samoa *Garuga floribunda* is a common, large tree in lowland forests (Christophersen in Bishop Mus. Bull. 128: 111. 1935). Neither B. E. V. Parham (in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 70, 73, 149. 1972) nor Whistler (in *Allertonia* 2: 159. 1980) suggests that the species might be an introduction. However, unless it is found to occur naturally in Fiji, the thought must be entertained that *Garuga* is not indigenous east of the New Hebrides.

Garuga floribunda is at once distinguished from the known indigenous Burseraceae in Fiji by its numerous (9-21) leaflets with crenate-serrate blades and its frequent stipels (cf. Leenhouts, 1956, fig. 6), by its \varnothing , 5-merous flowers, and by its fruits with 1-5 1-seeded pyrenes (rather than with a single pyrene that is either 2- or 3-locular or has a trace of flattened, sterile locules).

KEY TO GENERA

Flowers in our species small, glabrous, the calyx at anthesis 2-3 mm. long and in diameter, the petals 2-3 \times 1.5-2.5 mm.; calyx in fruit rotate, 3-4 mm. in diameter, the disk conspicuous, forming a persistent, annular pulvinus below fruit; fruit ovoid, acute at apex, with a thin, dry pericarp and papyraceous pyrene walls, the pyrene 1-seeded, with 2 sterile cells fully compressed; stipules none.

1. *Haplolobus*

Flowers in our species larger, the calyx at anthesis 3-8 mm. long, the petals more than 4 mm. long, pilose without; calyx in fruit at least 5 mm. in diameter, the disk comparatively inconspicuous; fruit with a fleshy pericarp and stony pyrene walls, the locules 3 (but 1 or 2 often sterile and slightly to strongly reduced), the seed 1 per fertile locule; stipules usually present (as in all our species).

.2. *Canarium*

1. **HAPLOLOBUS** Lam in Ann. Jard. Bot. Buitenzorg 42: 25. 1931; Husson & Lam in *Blumea* 7: 419. 1953; Leenh. in Fl. Males. I. 5: 238. 1956; Lam in *Blumea* 9: 243. 1958; Leenh. in op. cit. 20: 283. 1973.

Dioecious, estipulate trees; leaves imparipinnate (rarely unifoliolate), the leaflets 3-13, with entire blades; inflorescences mostly axillary, rarely appearing terminal, usually short-pedunculate; flowers 3-merous, unisexual (σ with pistillodia, \varnothing with slightly reduced but probably always sterile stamens), small, the σ usually slightly larger than the \varnothing , the receptacle flat, narrow; calyx cupuliform, 3-lobed to subtruncate, persistent in fruit but not enlarged; petals 3, valvate or slightly imbricate in middle, slightly thickened and inflexed at tip; disk intrastaminal, free from receptacle, erect, 6-lobed or undulate or truncate, glabrous, appressed to pistil or pistillode, flattened and spreading under fruit; stamens 6, glabrous, the filaments free or adnate to disk; ovary glabrous (in σ flowers reduced and sometimes hardly protruding from disk), 3-celled, the septa thin, the stigma 3-lobed or truncate, sessile or subsessile; fruits ovoid to ellipsoid, infrequently globose, often subacute at apex, the styler remnant terminal, the pericarp thin and dry, the pyrenes connate, with papyraceous walls (2



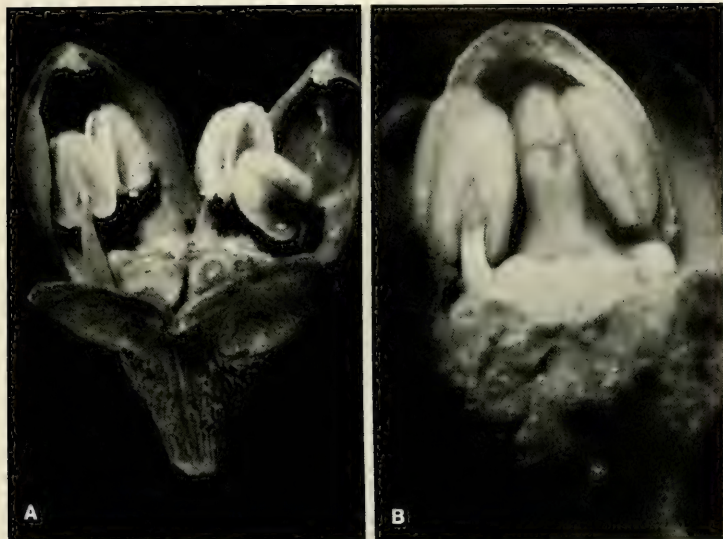


FIGURE 102. *Haplolobus floribundus* subsp. *salomonensis* var. *salomonensis*: A, ♂ flower with 1 petal and 2 stamens removed, showing disk and inconspicuous pistillode, $\times 20$; B, ♀ flower with 1 calyx lobe, 2 petals, and 2 stamens removed, showing disk and gynoecium, $\times 40$. A from *Howard 44*, B from *DF 1198*.

sterile cells fully compressed), 1-seeded; seed ovoid to ellipsoid, the testa very thin, the cotyledons plano-convex, thick, entire.

TYPE SPECIES: *Haplolobus moluccanus* Lam (= *H. floribundus* (K. Schum.) Lam subsp. *moluccanus* (Lam) Leenh.).

DISTRIBUTION: Borneo and the Moluccas eastward to Fiji and Samoa, with about 13 species and with a center of abundance in New Guinea. One species is indigenous in Fiji.

USEFUL TREATMENTS OF GENUS: HUSSON, A. M., & H. J. LAM. Revision of the Burseraceae of the Malaysian area in a wider sense: V. *Haplolobus*. *Blumea* 7: 413-458. 1953. LAM, H. J. Revision of the Burseraceae of the Malaysian area in a wider sense: Vb. *Haplolobus*, a revised revision. *Blumea* 9: 237-272. 1958. LEENHOUTS, P. W. A revision of *Haplolobus* (Burseraceae). *Blumea* 20: 283-310. 1973.

The three listed revisions of *Haplolobus* show how recently an understanding of this genus has been attained. Husson and Lam (1953) recognized 21 species and treated *H. floribundus* (K. Schum.) Lam as endemic to New Guinea. Their only species occurring in the Fijian Region was *H. aneityensis* (Guillaumin) Husson (taken to include *H. salomonensis* C. T. White), given a range including the Solomons, Santa Cruz Islands, New Hebrides, Fiji, and Samoa. In his "revised revision" of 1958 Lam reduced the number of species to 17, taking *H. floribundus* to include *H. aneityensis* and *H. salomonensis*. In the most recent study of the genus Leenhouts (1973) considers

FIGURE 101. *Haplolobus floribundus* subsp. *salomonensis* var. *salomonensis*: A, distal portion of branchlet, with foliage and ♂ inflorescences, $\times 1/3$; B, ♂ inflorescence, $\times 2$; C, ♂ flowers, $\times 8$; D, infructescences with mature fruits, $\times 1$. A from *DA 14709*, B & C from *DA 15642*, D from *Smith 5858*.

it to comprise 13 species. In his treatment of *H. floribundus* four subspecies are recognized, the specimens of this alliance from the islands east of New Guinea all representing subsp. *salomonensis*, and all except two of these (from New Georgia, Solomon Islands) falling into var. *salomonensis*. *Haplolobus floribundus* as thus construed is the most variable and widespread species of the genus, and Leenhouts (p. 301) considers his subspecies to represent tendencies rather than stabilized taxa.

Only two or three Fijian collections have been cited by the mentioned authors; although 23 such collections (all cited below) are now at hand, it is curious that the genus eluded collectors in Fiji prior to 1927, when Gillespie obtained a sterile but unmistakable specimen. Fijian material is remarkably uniform but seems correctly referred to the widespread subsp. *salomonensis*.

1. **Haplolobus floribundus** (K. Schum.) Lam in Ann. Jard. Bot. Buitenzorg 42: 207. 1932; Husson & Lam in Blumea 7: 436. 1953; Leenh. in Fl. Males. I. 5: 244. 1956; Lam in Blumea 9: 251. 1958; Leenh. in op. cit. 20: 295. 1973.

Santaria floribunda K. Schum. in K. Schum. & Hollr. Fl. Kais. Wilhelmsl. 63. 1889.

TYPIFICATION: The type of the species is *Holrunga 543* (B HOLOTYPE probably destroyed; K LECTOTYPE (Husson & Lam, 1953, p. 438); ISOLECTOTYPES at MEL, P), collected in February, 1887, near Konstantinshafen, Papua New Guinea.

DISTRIBUTION: Celebes and the Moluccas eastward to Samoa, most abundant in New Guinea, with four subspecies; only subsp. *salomonensis* extends into Melanesia and western Polynesia.

1a. **Haplolobus floribundus** subsp. *salomonensis* (C. T. White) Leenh. in Blumea 20: 298. 1973. FIGURES 101, 102.

Canarium aneityense Guillaumin in J. Arnold Arb. 14: 54. 1933.

Canarium sp. Christophersen in Bishop Mus. Bull. 128: 113. 1935; (?) Yuncker in op. cit. 184: 44. 1945.

Haplolobus salomonensis C. T. White in J. Arnold Arb. 31: 92. 1950.

Haplolobus aneityense Husson in Blumea 7: 449. fig. 14. 1953; Leenh. in Fl. Males. I. 5: 239. 1956; J. W. Parham, Pl. Fiji Isl. 168. 1964.

Haplolobus floribundus sensu J. W. Parham, Pl. Fiji Isl. ed. 2. 239. 1972; non sensu str.

As seen in Fiji, *Haplolobus floribundus* subsp. *salomonensis* is a tree 5–24 m. high, the trunk to 60 cm. (or more?) in diameter and with white, resinous latex, occurring in dense or secondary forest at elevations of 90–850 m. The slightly fragrant flowers have white petals. Flowers have been noted between February and May, fruits between June and January. In Fiji, as elsewhere, galls are often found on the inflorescences and leaves of *H. floribundus*, as noted by Leenhouts (1973, p. 285. fig. 2, 4).

TYPIFICATION AND NOMENCLATURE: *Canarium aneityense*, the oldest binomial attached to this concept, is typified by *Kajewski 943* (A HOLOTYPE; ISOTYPES at P, US), collected March 19, 1929, at Anelgauhut Bay, Aneityum, New Hebrides. *Haplolobus salomonensis*, the basis of the trinomial, is based on *F. S. Walker (BSIP 242)* (BRI HOLOTYPE; ISOTYPES at A, K, L), obtained Feb. 26, 1946, at Beaufort Bay, Kimbau River, Guadalcanal, Solomon Islands. Christophersen's 1935 reference to *Canarium* sp. is based on *Christophersen 3279*, from Savai'i, Samoa, and Yuncker's 1945 reference on an observation (without specimen) by Guest on Tau Island (cf. Husson & Lam, 1953, p. 452).

DISTRIBUTION: New Britain, Solomon and Santa Cruz Islands, New Hebrides, Fiji, and Samoa; only var. *salomonensis* has this inclusive distribution. In Fiji the taxon is thus far known only from Viti Levu and Kandavu but may be anticipated on other high islands.

LOCAL NAMES AND USE: Fijians and foresters do not distinguish among the present taxon and the three indigenous species of *Canarium*, all of which are known as *kauningai* and *kaunithina*; *nggalingawa* was noted for *Smith 5858*. The tree is well known for its timber, primarily used as a case wood.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vicinity of Mbukuya, Mangondro Tikina, *DF 1267, 1268*; hills between Nandala and Nukunuku Creeks, along trail from Nandarivatu toward Lewa, *Smith 6160*; hills between Nggaliwana and Tumbeindreketi Creeks, east of the sawmill at Navai, *Smith 5858*. NADRONGA & NAVOSA: Nausori Highlands, *DA 15626*; Tamanua Creek area, Mbaravi Tikina, *DA L.14207 (Berry 62)*. SERUA: Nathengathenga Creek, upper Navua River tributary, *DF 1198 (Damana 221)*; inland from Navutulevu, *Howard 41*, p. p. 44; inland from Namboutini, *DA L.22303*; inland from Ngaloa, *DA 15669, DF S1776/2*, p. p. NAMOSI: Nambukavesi Creek, 7 miles inland, *DF 648*, p. p. (*NI-13, S1407/3*). NAITASIRI: Waimanu River, *DA 15642*; Tholo-i-suva, *DA 12195 (DF 45, Watkins 714)*, *DA 13833 (DF 136)*, *DA 14639, 14709, DF 544 (Bola 143)*, *Drova 1*. REWA: Mt. Korombamba, near summit, *Gillespie 2314*. KANDAVU: Vicinity of Naikorokoro, *DF 848*. FIJI without further locality, *Howard 219*.

2. *CANARIUM* L. Herb. Amb. 10, as *Cenarium*. 1754; corr. L. Amoen. Acad. 4: 121. 1759; Seem. Fl. Vit. 34. 1865; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 443. 1931; Leenh. in Bishop Mus. Bull. 216: 2. 1955, in Fl. Males. I. 5: 249. 1956, in *Blumea* 9: 329. 1959.

Dioecious trees, occasionally shrubs (rarely reported as lianas), usually stipulate (as in all our species); leaves imparipinnate, with 3-23 leaflets (lateral ones opposite or essentially so), very rarely unifoliolate, the leaflet blade margins entire to dentate or serrate; inflorescences axillary or pseudoterminal or terminal, the ♀ usually shorter than the ♂; flowers 3-merous, unisexual (♂ with much reduced to absent pistillode, ♀ with sterile and less well-developed stamens), the receptacle flat or concave; calyx cupuliform, 3-lobed about half its length, pilose or glabrous without, usually densely sericeous within; petals 3, free, usually imbricate in bud, induplicate-valvate distally, fleshy, usually with a small, inflexed apex, usually pilose without; disk intrastaminal, usually 6-lobed, well developed in ♂ flowers and adnate to stamens or to pistillode, in ♀ flowers often adnate to stamens and to receptacle; stamens 6 (rarely 3), free to connate, the epipetalous ones sometimes partially or entirely abortive; ovary ovoid to ellipsoid, 3-celled, the style cylindrical, the stigma small, capitate, faintly 3-lobed; fruits variable but often oblong-ovoid, glabrous to pilose (especially toward base and apex), the pericarp fleshy (or rarely fibrous), the pyrenes connate, with thick, stony walls, 3-celled (1 or 2 cells often sterile and slightly to strongly reduced), the seeds 1 per fertile locule, the cotyledons palmatifid to 3-foliolate, contortuplicate or folded.

TYPE SPECIES: *Canarium indicum* L.

DISTRIBUTION: Tropical Africa and Indian Ocean islands to southern China and southeastward to northeastern Australia, Micronesia, Tonga, and Samoa, with about 100 species. Five species are here recorded from Fiji, three of them indigenous and two cultivated (and perhaps sparingly naturalized).

USEFUL TREATMENTS OF GENUS: LEENHOUTS, P. W. The genus *Canarium* in the Pacific. Bishop Mus. Bull. 216: 1-53. 1955. LEENHOUTS, P. W. Revision of the Burseraceae of the Malaysian area in a wider sense: Xa. *Canarium* Stickm. *Blumea* 9: 275-475. 1959.

KEY TO SPECIES

Stipules auricle-shaped, leaving prominent, drop-shaped scars on petiole near base, or flattened and foliaceous, leaving linear, long and narrow scars at conjunction of petiole with branchlet (less often entirely on base of petiole) (sect. *Canarium*).

Fruiting calyx 6-11 mm. in diameter, glabrous without, sparsely pilose within; fruits ovoid to obovoid, drying 3-angled (one side usually broader and more flattened than the other two), in our varieties 2.5-4.3 × 2-2.8 × 1.4-2.5 cm.; flowers 4-6 mm. long, the petals usually 4.5-5 mm. long; stipules auricle-shaped, 4-17 × 2-11 mm., early caducous, inserted on petiole 2-12 mm. from its base; stipular scar prominent, drop-shaped, longitudinal or oblique; indigenous. I. *C. harveyi*

Fruiting calyx 7–25 mm. in diameter, appressed-pubescent without; fruits ovoid, drying round to subtrigonal in cross section, 3–6 × 1.5–4 × 1.5–4 cm.; flowers 5–15 mm. long; stipules foliaceous, ovate to oblong (or suborbicular), 10–60 × 5–40 mm., inserted at conjunction of petiole with branchlet, less often entirely on base of petiole; stipular scar linear, long and narrow; cultivated or sparingly naturalized.

Plants comparatively robust in all parts, the branchlets 7–13 (–25) mm. in diameter; stipules 15–60 × 12–40 mm., coarsely to minutely fimbriate-dentate to undulate at margin, often long-persistent; ♂ flowers about 10 mm. long; ♀ flowers to 15 mm. long; infructescences with up to 30 fruits; fruiting calyx flat to cupuliform, 17–25 mm. in diameter, often with a ruptured margin.

Plants comparatively slender in all parts, the branchlets about 5–8 mm. in diameter; stipules 10–50 × 5–18 mm., entire at margin, readily caducous; ♂ flowers about 5 mm. long; ♀ flowers 6–7 (–12) mm. long; infructescences with up to 12 fruits; fruiting calyx flat, 7–13 mm. in diameter, with an undulate margin. 2. *C. indicum*
 Stipules narrowly lanceolate to subulate, 1–7 (–10) mm. long, the scars narrow and linear or minute and ovate to circular (sect. *Pimela*); indigenous. 3. *C. vulgare*

Stipules inserted at conjunction of petiole with branchlet or on petiole up to 3 mm. from base, narrowly lanceolate, flattened, (2–) 6–7 mm. long, abruptly broadened proximally and (1.5–) 4–8 mm. broad at base, sometimes subsistent, leaving a narrow scar or ridge; calyx glabrous without at anthesis; petals to 8 mm. long, not much projecting from calyx at anthesis; fruiting calyx usually flat but sometimes hypocrateriform, 12–15 mm. in apical diameter; fruits ovoid, acute to subacute or less often subrounded at both ends, 3–3.8 × 1.8–2.5 cm. 4. *C. vanikoroense*

Stipules inserted on branchlet at base of petiole or on petiole 1–15 (–30) mm. from base, subulate, not flattened, 1–4 (–10) mm. long, early caducous, leaving a minute ovate to circular scar; calyx thin-pilose without at anthesis (infrequently completely glabrous); petals 8–13 mm. long and obviously projecting from calyx at anthesis; fruiting calyx flat to distinctly hypocrateriform, 6.5–12 mm. in apical diameter; fruits variable, fusiform to ovoid, ellipsoid, or nearly subglobose, acute to rounded at both ends, 1.5–3 (–4) × 1–1.7 (–2) cm. 5. *C. vitiensis*

1. *Canarium harveyi* Seem. Fl. Vit. 35. 1865; Leenh. in Bishop Mus. Bull. 216: 35. 1955, in *Blumea* 9: 355. 1959.

DISTRIBUTION: Solomon Islands to Samoa, Tonga, and Niue, with four varieties, two of which occur in Fiji.

KEY TO VARIETIES

Plants comparatively robust, the branchlets (3–) 4–7 (–10) mm. in diameter; leaves (15–) 20–45 cm. long, the petioles 3–11 cm. long, the interjugal parts of rachis 1.5–7 cm. long, the lateral petiolules 1–3 cm. long, the terminal petiolule (1–) 3–5 cm. long, the leaflet blades (5–) 8–20 × (2.5–) 4–10 cm. (in juvenile plants to 35 × 21 cm., with other leaf parts correspondingly large). 1a. var. *harveyi*
 Plants comparatively slender, the branchlets 3–5 mm. in diameter; leaves 12–28 cm. long, the petioles 2.5–5 cm. long, the interjugal parts of rachis 1.5–3.5 cm. long, the lateral petiolules 0.9–1.5 cm. long, the terminal petiolule to 4 cm. long, the leaflet blades 4–11 × 2–6 cm. 1b. var. *scandens*

1a. *Canarium harveyi* var. *harveyi*; Leenh. in Bishop Mus. Bull. 216: 38. fig. 15, a–c, e, f, h, n, 16, e. 1955, in *Blumea* 9: 357. 1959; J. W. Parham, Pl. Fiji Isl. 167. 1964, ed. 2. 236. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 53. 1970.

FIGURES 103B, 105A–C.

Canarium harveyi sensu Seem. Fl. Vit. 35. 1865; Engl. in DC. Monogr. Phan. 4: 133. 1883; Yuncker in Bishop Mus. Bull. 178: 71. 1943, in op. cit. 220: 154. 1959; non sensu str.

Canarium mafoa Christophersen in Bishop Mus. Bull. 128: 111. fig. 14. 1935; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 69. 1972.

As seen in Fiji, the typical variety of *Canarium harveyi* is a tree 3–21 m. high, with thin, colorless latex, occurring in often dense forest at elevations from near sea level to 600 m. The fruits, at first green, become purplish to black at maturity. Flowers have been noted between February and June, fruits between April and December.

TYPIFICATION: *Canarium harveyi* is typified by *Harvey* (K HOLOTYPE), collected in fruit between August and October, 1855, on “Vava’u and Lifuka,” Tonga; *C. mafoa* by

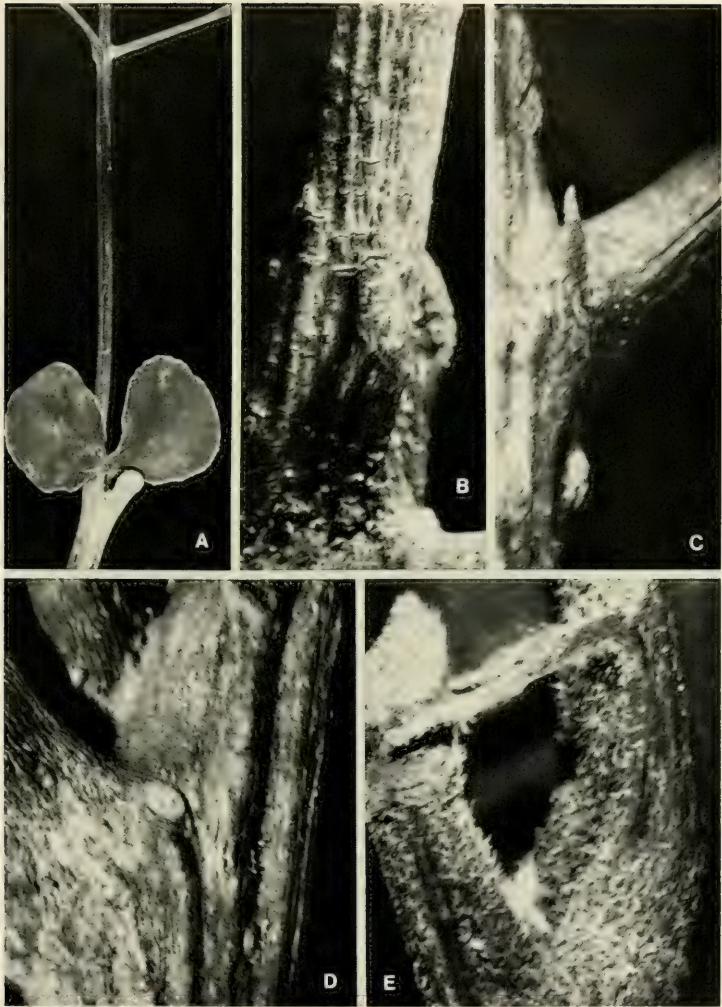


FIGURE 103. A, *Canarium harveyi* var. *scandens*; stipules near base of petiole and petiolules of proximal leaflets, $\times 2$. B, *Canarium harveyi* var. *harveyi*; stipular scars on petiole, $\times 10$. C-E, *Canarium vitiense*; C, stipule at conjunction of petiole with branchlet, $\times 10$; D, stipular scar at conjunction of petiole with branchlet, $\times 10$; E, stipules on petiole well above its base, $\times 10$. A from DA 7198, B from Smith 9314, C from Gillespie 4521, D from Smith 9422, E from Lelean & Stevens (LAE 51286) (New Britain).

Christophersen 3373 (BISH HOLOTYPE and ISOTYPE; ISOTYPE at L), also in fruit, collected Nov. 20, 1931, between Siuvao and Auala, Savai'i, Samoa. The differences between the two concepts are inconsequential.

DISTRIBUTION: Fiji, Tonga, Niue, and Samoa. In Fiji it is thus far known from six islands, including some in the Lau Group.

LOCAL NAMES AND USE: In addition to the usual Fijian names for indigenous Burseraceae, *kaunithina* and *kauningai*, recorded names are *ndawandawa* (Ngau) and *yanga* (Fulanga); the species is noted as a timber tree.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Nausori Highlands, *DF 482 (Damanu 129), Damanu NH-26*. SERUA: Inland from Namboutini, *Damanu R-14*; Yarawa, *DA L.13703 (Berry 118)*; hills west of Waivunu Creek, between Ngaloa and Korovou, *Smith 9314*; Ndeumba, *DA 9214 (Mc Kee 2778)*. NAITASIRE: Waimanu River, *DA L.13346*; vicinity of Nasinu, *Gillespie 3620, 3658*. REWA: Mt. Korombamba, *DA 1271*. NGAU: Hills east of Herald Bay, inland from Sawaieke, *Smith 7767*. VANUA LEVU: MBUA: Koromba Forest, *DA 15109*. THAKAUNDROVE: Vicinity of Mbangasau, *Howard 114*; Navonu Creek, Natewa Peninsula, *Howard 82, 102*. NAITAMBA: *DA L.11757*. VANUA MBALAVU: Northern limestone section, *Smith 1506*. FULANGA: On limestone formation, *Smith 1151*.

1b. *Canarium harveyi* var. *scandens* Leenh. in Bishop Mus. Bull. **216**: 39, fig. 15, m, p-r, 16, a, b, d. 1955, in *Blumea* **9**: 357. 1959; J. W. Parham, Pl. Fiji Isl. 167. 1964, ed. 2. 236. 1972. FIGURE 103A.

The variety is probably a tree, perhaps slender and with twining tendencies (type material reported to have come from a liana), occurring in forest from near sea level to an elevation of 400 m. Flowers have been observed in March, fruits in May, June, and August.

TYPIFICATION: The type is *Degener 15196* (A HOLOTYPE; ISOTYPES at BISH, K, US), collected May 5, 1941, at Vatutavathe, vicinity of Ngaloa, Serua Province, Viti Levu.

DISTRIBUTION: As here construed var. *scandens* is endemic to Fiji and is known only from southern Viti Levu.

AVAILABLE COLLECTIONS: VITI LEVU: SERUA: Vatuvilakia, vicinity of Ngaloa, *Degener 15159*; Rovondrau Bay, *DA 7198*. NAITASIRE: Tholo-i-suva, *DA 13681 (L.8241)*. REWA: Southeastern slope of Mt. Korombamba, *Gillespie 2320*.

Although I here retain Leenhouts's var. *scandens*, I lack confidence in its separation from var. *harveyi*. The principal impetus for its recognition seems to have been the field indication that the type material came from a liana. Other specimens from southern Viti Levu that appear to represent var. *scandens* are not reported as climbing, and it seems possible that the original notation was in error (or that perhaps some slender branchlets of certain trees tend to scramble or twine). In this connection a comment by Leenhouts (in *Fl. Males. I*: 5: 211. 1956) may be quoted: "In a very few cases (especially *Canarium*) representatives of this family are said to be climbers. In nearly all these cases there is reason to doubt the reliability of the field notes. . . This point deserves the full attention of collectors!" In virtually all the other characters used by Leenhouts to separate these two varieties (diameter of branchlets, length of leaves, petioles, and petiolules, and size of leaflet blades) there is substantial overlap, and I find no differences in size or shape of fruits. It can only be said that the specimens here denoted as var. *scandens* are inclined to be reduced in some of their dimensions as compared with individuals of var. *harveyi*, in which great dimensional variability must be admitted. The two varieties of *C. harveyi* recognized by Leenhouts from the Solomons and New Hebrides appear to be more realistic than var. *scandens*.

2. *Canarium indicum* L. Amoen. Acad. **4**: 143. 1759; Leenh. in Bishop Mus. Bull. **216**: 26. fig. 12. 1955, in Fl. Males. I. **5**: 266. fig. 21, g. 31-34. 1956, in Blumea **9**: 359. 1959; Foreman in Bot. Bull. Dept. For. Lae **5**: 92. fig. 1971; J. W. Parham, Pl. Fiji Isl. ed. 2. 237. 1972.

Canarium commune L. Mant. Pl. 127, p. p. majore. 1767.

Canarium nungi Guillaumin in J. Arnold Arb. **12**: 236. fig. 2. A. 1931.

As it is seen in Fiji, *Canarium indicum* is a cultivated tree, perhaps sometimes semi-naturalized along roadsides, noted in fruit between September and January. Where indigenous the species may attain a height of 40 m.

TIPIFICATION AND NOMENCLATURE: The confused nomenclature of *Canarium indicum* L. and *C. commune* L. was discussed in 1955 by Leenhouts, whose conclusions are here accepted. Linnaeus's first binomial in *Canarium*, *C. indicum* (1759), is taken to apply to the greater part of *Canarium vulgare* Rumph. (Herb. Amb. **2**: 145. pl. 47. 1741); the later binomial of Linnaeus, *C. commune* (1767), is taken as a replacement for *C. indicum*. Although the major elements of Rumphius's pl. 47 could be considered the holotype of *C. indicum*, Leenhouts listed *Hort. Bot. bogor. VI. B. 65* (L. NEOTYPE; ISONEOTYPES at K, NY, P, etc.). *Canarium nungi*, described from the New Hebrides without indication of relationship, was based on two syntypes, *Kajewski 122* from Tanna and *Kajewski 243* from Eromanga. Our material of *C. indicum* falls into var. *indicum*; a second variety (New Guinea only) was described by Leenhouts in *Blumea* **8**: 182. 1955.

The lesser portion of Rumphius's pl. 47 being, by the above reasoning, left without a valid name, Leenhouts proposed for it the new name *Canarium vulgare* Leenh.

DISTRIBUTION: From the Moluccas and New Guinea eastward to the New Hebrides, and frequently cultivated elsewhere, as in Fiji.

LOCAL NAMES AND USES: The *galip* or *galip nut* is grown in Fiji as a shade tree, and its seeds are edible; its wood may be used where the species is indigenous for light construction, interior finishes, etc.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Nasinu, along roadside at Approved School, DA L.22423 (DF 123). KANDAVU: Mataso, DA 14162 (L.10895).

3. *Canarium vulgare* Leenh. in Bishop Mus. Bull. **216**: 31. fig. 13. (Oct. 20) 1955, in *Blumea* **8**: 188. (Dec. 31) 1955, in Fl. Males. I. **5**: 263. fig. 19, 22, g. 26-30. 1956, in *Blumea* **9**: 358. 1959; J. W. Parham, Pl. Fiji Isl. **168**. 1964, ed. 2. 239. 1972.

Canarium commune L. Mant. Pl. 127, p. p. minore. 1767; sensu Lam in Bull. Jard. Bot. Buitenzorg III. **12**: 509. 1932; Christophersen in Bishop Mus. Bull. **128**: 113. 1935; J. W. Parham in Agr. J. Dept. Agr. Fiji **19**: 97. 1948, in op. cit. **29**: 32. 1959; et auct.

Canarium indicum sensu B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 150. 1972; non L.

As it occurs in Fiji *Canarium vulgare* is a tree 9-15 m. high (up to 45 m. and buttressed where indigenous), cultivated near sea level in gardens, experimental stations, and plantations, possibly becoming naturalized. Dated material indicates that flowers have been obtained in February and July, fruits only in June.

TIPIFICATION: To typify his new species Leenhouts selected *Becking 142* (L. HOLOTYPE; ISOTYPE at BO), collected in April, 1920, at Tjandikusuma, Bali.

DISTRIBUTION: Indigenous from islands near eastern Java to Celebes and the Moluccas, but cultivated in tropical areas throughout the world, as in Fiji. Presumably both this species and the preceding have been brought into Fiji during the present century.

LOCAL NAMES AND USES: The *Java almond* or *pili nut* is used as a shade tree in plantations, gardens, and along roadsides; the seeds are edible and are used as a substitute for almonds.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Agricultural Station, Nathotholevu, DA 16702, L.28991, L.28992. NAITASIRE: Tholo-i-suva, DA 84; Nasinu Experiment Station, DA 1540, 1561. REWA: Suva Botanical Gardens, DA L.11762; Suva, along street, DA, Jan. 5, 1949. VANUA LEVU: MATHUATA: District Farm Northern, Seanggangga, and vicinity, DA 13497, 16667.

4. *Canarium vanikoroense* Leenh. in Bishop Mus. Bull. **216**: 7. fig. 3. 1955, in Blumea **9**: 449. 1959; J. W. Parham, Pl. Fiji Isl. 168. 1964, ed. 2. 239. 1972.

FIGURES 104A-C, 106A.

Canarium linguistipulum Leenh. in Bishop Mus. Bull. **216**: 5. fig. 2. 1955.

A tree 15-25 m. high, occurring at elevations of 100-250 m. in dense or secondary forest; the petals are white, and the fruit turns from bluish green to black at maturity. Flowers have been collected in March, September, and November, while fruits seem quite persistent and have been obtained in months scattered throughout the year. The species is well characterized by its lanceolate or somewhat linguiform, subcoriaceous, often subsistent stipules, and also by the glossy leaflet blades with conspicuous veinlet reticulation; leaflet blades are predominantly ovate but variable in shape, 8-18 × 3.5-8.5 cm.

TIPIFICATION AND NOMENCLATURE: *Canarium vanikoroense* is based on *Kajewski* 539 (A HOLOTYPE; ISOTYPES AT BISH, K, P, US), collected Sept. 25, 1928, on Vanikoro, Santa Cruz Islands; *C. linguistipulum* on *Tothill* 513 (K HOLOTYPE), obtained May 6, 1929, from "9 miles, Central Road" (presumably near Tholo-i-suva), Naitasiri Province, Viti Levu (this is the locality stated on the holotype rather than "quarry near Suva" as cited by Leenhouts). In combining these two taxa in 1959 Leenhouts was not entirely sure of their conspecificity, but sufficient Fijian material is now available to indicate that there are no consequential differences.

DISTRIBUTION: Santa Cruz Islands and Fiji; doubtless to be expected (and perhaps already known) from the New Hebrides proper.

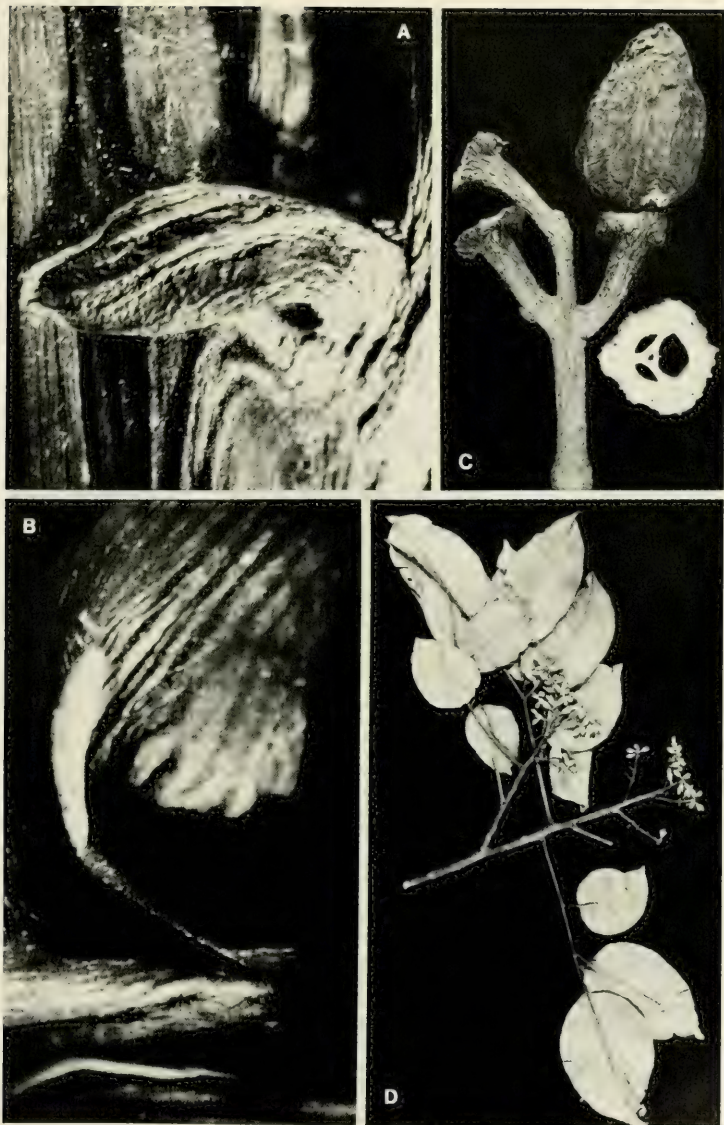
LOCAL NAMES AND USE: Names applied to this timber tree, in addition to *kaunithina* and *kauningai* (used indiscriminately for indigenous species of *Canarium* and *Haplolobus*), have been recorded as *kaunisinga* (Serua), *kaundakua* (Naitasiri), and *vuso-vuso* (Vanua Levu).

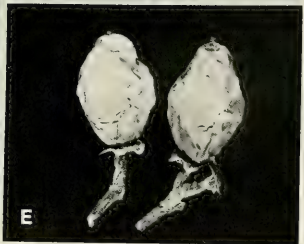
AVAILABLE COLLECTIONS: VITI LEVU: SERUA: Nathengathenga Creek, upper Navua River, DA L.13347 (*Berry* 82), L.13348; inland from Namboutini, DA 14257, DF 575 or 799 (S1407/6); inland from Ngaloa, DF S1776/2, p. p. NAMOSI: Lombau River, Bola 79-A. NAITASIRE: Waimanu River, *Berry* 65; Tholo-i-suva, DA 10260, 13783, p. p. (DF 242, Bola 90); Central Road, *Tothill* 422; vicinity of Nasinu, *Gillespie* 3560, 3616. VANUA LEVU: MATHUATA: Southern base of Mathuata Range, north of Natua, *Smith* 6782. VANUA LEVU without further locality, DF L.12444. FIJI without further locality, *Howard* 162.

5. *Canarium vitiense* A. Gray, Bot. U. S. Expl. Exped. **1**: 373. 1854; Seem. in Bonplandia **9**: 255. 1861; Viti, 435. 1862, Fl. Vit. 35. 1865; Horne, A Year in Fiji, 258. 1881; Engl. in DC. Monogr. Phan. **4**: 134. 1883; Drake, Ill. Fl. Ins. Mar. Pac. 135. 1890; Leenh. in Bishop Mus. Bull. **216**: 17. fig. 8. 1955, in Blumea **9**: 451. 1959; J. W. Parham, Pl. Fiji Isl. 168. 1964, ed. 2. 239. fig. 70. 1972; Leenh. in Blumea **13**: 166. 1965, in Fl. Males. I. **6**: 922. 1972, in op. cit. I. **7**: 822. 1976.

FIGURES 103C-E, 104D, 105D & E, 106B.

FIGURE 104. A-C, *Canarium vanikoroense*; A, stipule at conjunction of petiole with branchlet, × 10; B, stipular scar on base of petiole, × 10; C, fruit and cross section of fruit, × 1. D, *Canarium vitiense*; distal portion of branchlet, with foliage and ♂ inflorescences, × 1/4. A & B from *Kajewski* 539 (Vanikoro), C from *Gillespie* 3616, D from DA 15623.





Canarium vitiense var. β A. Gray, Bot. U. S. Expl. Exped. 1: 373. 1854.

Canarium samoense Engl. in DC. Monogr. Phan. 4: 134. 1883; Christophersen in Bishop Mus. Bull. 128: 113. 1935; Yuncker in op. cit. 220: 155. 1959; Leenh. in Blumea 9: 452. 1959; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 68. 1972.

Canarium schlechteri Lauterb. in Bot. Jahrb. 56: 328. 1920; Leenh. in Blumea 9: 444. 1959, in Fl. Males. I. 5: 296, fig. 20, e. 1956.

Canarium smithii Leenh. in Bishop Mus. Bull. 216: 12, fig. 6. 1955, in Blumea 9: 450. 1959; J. W. Parham, Pl. Fiji Isl. 168. 1964.

Canarium bacciferum Leenh. in Bishop Mus. Bull. 216: 19, fig. 9. 1955.

Canarium pilosum subsp. *pilosum* sensu Leenh. in Bishop Mus. Bull. 216: 25, quoad spec. vit. 1955, in Blumea 9: 400, quoad spec. vit. 1959; J. W. Parham, Pl. Fiji Isl. 168. 1964, ed. 2. 237. 1972; non *C. pilosum* A. W. Bennett.

In Fiji *Canarium vitiense* is seen as a slender or spreading tree 7–30 m. high, with a trunk to 1.5 m. in diameter and with pale or milky latex, occurring in dense or dry forest or thickets from near sea level to 1,000 m. The flower buds are greenish white, the mature petals white or cream-colored, and the fruits when young green to bluish, becoming dull purple to black at maturity. The 1–6-jugate leaves have elliptic to elliptic-oblong leaflet blades 3.5–15 \times 2.5–6.5 cm., essentially similar to those of *C. vanikoroense* but usually less glossy and with less conspicuous veinlet reticulation. Flowers and fruits are found throughout the year.

TYPEFIICATION AND NOMENCLATURE: The type of *Canarium vitiense* is *U. S. Expl. Exped.* (US 15524 HOLOTYPE; ISOTYPES at GH, K, P), collected in 1840 in mountains of the Mathuata coast at 2,000 ft. (Mathuata Range?), Mathuata Province, Vanua Levu. Gray gave no locality for his var. β but it was based on *U. S. Expl. Exped.* (US 15525). *Canarium samoense* was based on *Powell 311* (K HOLOTYPE), from Samoa without detailed locality. The type of *C. schlechteri* is *Schlechter 16884* (B HOLOTYPE destroyed; ISOTYPES at L, P, WRSL), collected Nov. 25, 1907, in forest around Djamu, Papua New Guinea. *Canarium smithii* is typified by *Smith 6708* (A HOLOTYPE; many ISOTYPES), obtained Nov. 28, 1947, on the Seangangga Plateau, in drainage of Korovuli River, vicinity of Natua, Mathuata Province, Vanua Levu; *C. bacciferum* by *Smith 6275* (A HOLOTYPE; many ISOTYPES), collected Sept. 29, 1947, on slopes of the escarpment north of Nandarivatu, Mba Province, Viti Levu. These concepts were finally united by Leenhouts in 1965, as noted below.

DISTRIBUTION: In its extended sense *Canarium vitiense* is said to occur from western New Guinea and northern Queensland eastward to Fiji, Tonga, and Samoa. From Fiji about 65 collections are known from four of the high islands, but it will doubtless be found on several other islands.

LOCAL NAMES AND USES: *Kaunithina* and *kauningai* are the usual names; locally noted are *nggaunggau* (Mba), *kauloa* (Ra), *mbulundavui* (Tailevu), *ndawandawa* (Ovalau), and *ndindi* (Mathuata). It is considered a commercially important timber tree and is locally used to provide house-building timbers. The seeds are occasionally eaten and the fruits are also noted as being attractive to pigeons.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 940*; Mbukuya, Mangondro Tikina, *DF 1262*; Mt. Nanggaranambuluta, east of Nandarivatu, *Stauffer & Koroiveibau 5825*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 15623*. SERUA: Nambukelevu, upper Navua River, *DA 15666* (*L.13818*); inland from Navutulevu, *Howard 39*; inland from Namboutini, *DF 959* (*Lora 16*); inland from Yarawa, *DF 1059* (*S1407/8*); hills north of Ngaloa, in drainage of Wainingere Creek, *Smith 9422*; hills between Navua River and Wainiyavu Creek, near Namuamua, *Smith 9019*. NAMOSI: Hills north

FIGURE 105. A–C, *Canarium harveyi* var. *harveyi*: A, distal portion of branchlet, with a leaf and a σ inflorescence, $\times 1/4$; B, σ flower, with 1 petal and 2 anthers removed, $\times 10$; C, fruits $\times 1$. D & E, *Canarium vitiense*: fruits, showing some of the variability, $\times 1$. A & B from *Smith 1151*, C from *Smith 7767*, D from *Smith 9422*, E from *Smith 8434*.

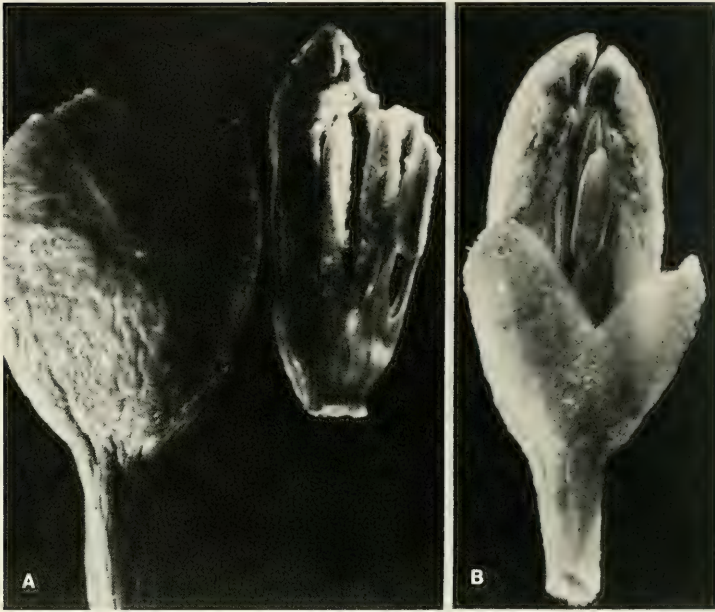


FIGURE 106. A, *Canarium vanikoroense*; ♂ flower, the corolla with 2 petals removed, $\times 10$. B, *Canarium vitiense*; ♂ flower with 1 petal removed, $\times 10$. A from *Kajewski 539* (Vanikoro), B from *Smith 9019*.

of Wainavindrau Creek, between Korombasambasanga Range and Mt. Naitarandamu, *Smith 8434*; Nambukavesi Creek, *DF 648*, p. p. (*S1407/3*). RA: Vicinity of Rewasa, near Vaileka, *Degener 15429*. NAITASIRI: Savura Creek, *DA 12218 (DF 68, Bola 1)*; Tholo-i-suva, *DA 11846*; vicinity of Nasinu, *Gillespie 3434*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7114*. REWA: Navesi, *Horne 686*; Nggoya Forest Reserve, *DA 13761 (DF 473, Damanu 122)*. OVALAU: Summit and adjacent slopes of Mt. Korotolotolu, west of Thawathi, *Smith 8050*; above Levuka reservoir, *Gillespie 4521*; Port Kinnaird, *Seemann 97*. KORO: Eastern slope of main ridge, *Smith 996*. VANUA LEVU: MATHUATA: Sarava, near Lambasa, *DF 849 (S1425/2)*; summit ridge of Mt. Numbuiloa, east of Lambasa, *Smith 6477*. THAKAUNDOVE: Nakoroutari, south of Lambasa, *DA 446 (Watkins 786)*.

In his first treatment of *Canarium* in the Pacific, Leenhouts (1955) accepted six species of sect. *Pimela* as occurring in the Fijian Region (Santa Cruz Islands to Samoa and Tonga): *C. linguistipulum*, *C. vanikoroense*, *C. smithii*, *C. vitiense*, *C. bacciferum*, and *C. samoense*. None of these supposedly Melanesian-Polynesian taxa were discussed by him (1958) in his *Flora Malesiana* treatment, but in his monograph of 1959 he reduced *C. linguistipulum* to *C. vanikoroense* and *C. bacciferum* to *C. smithii*. In further consideration (1965) Leenhouts expanded his concept of *C. vitiense* to include *C. samoense* and *C. smithii* and also material from New Guinea to the Solomon Islands, including *C. schlechteri*, a conclusion reflected in a revised key in *Flora Malesiana* (1972). Still later (1976) the distribution of *C. vitiense* was extended to western New Guinea and northern Queensland.

It is here readily agreed that only two species of sect. *Pimela* occur in the Fijian Region, *Canarium vanikoroense* and *C. vitiense*, and extension of the latter concept westward into New Guinea is also accepted. In this expanded concept of *C. vitiense* substantial variation must be admitted in indument, size and shape of leaflets, floral characters, and fruit shape and size. Furthermore, the stipules in Papuasian specimens (FIGURE 103E) are inclined to be the more persistent, longer, and often more highly placed on the petiole.

The record of *Canarium pilosum* in Fiji is based solely on *Gillespie 3434* (BISH), a sterile specimen which appears to me correctly placed in *C. vitiense*. Its stipular scars are typical for that species but occur on the petiole 10–15 mm. from its base, whereas in other Fijian specimens the scars are either on the branchlet or on the petiole 1–5 (–10) mm. from its base. However, in many New Guinean specimens of *C. vitiense* which fully agree with *Gillespie 3434* in indument, leaflet shape, and venation the stipular scar is noted 15–25 (–30) mm. above the petiole base.

Because the fruits of *Canarium*, like those of *Haplolobus*, are attractive to birds, it is probable that intermittent (and probably inadvertent) interchange of disseminules has been of long duration in these genera from Papuasias to Samoa.

It is sometimes difficult, on the basis of foliage, inflorescences, and fruits, to distinguish between *Canarium vanikoroense* and *C. vitiense*. The stipules and stipular scars, however, are quite different, although for practical purposes this distinction is not very satisfactory because stipules are caducous and scars are difficult or impossible to observe on many specimens.

FAMILY 135. SIMAROUBACEAE

SIMAROUBACEAE DC. in Ann. Mus. Hist. Nat. (Paris) 17: 422, as *Simarubeae*. 1811.

Trees or shrubs, usually monoecious or dioecious, usually stipulate and with bitter substances in bark, without latex; leaves alternate or rarely opposite, pinnately compound to unifoliolate or simple, lacking pellucid glands; inflorescences axillary or terminal, racemose, paniculate, or cymose; flowers small, actinomorphic, hypogynous, ♂ or unisexual by partial abortion of parts, 3–8-merous; calyx commonly deeply lobed, the lobes less often free, imbricate or valvate; petals free, imbricate or valvate, seldom lacking; disk usually present and intrastaminal, annular or cupuliform or semiglobose, sometimes modified into a gynophore; stamens or staminodes usually twice as many as petals, infrequently as many as or more than twice as many as petals, the filaments distinct, often with basal scales, the anthers 2-celled, introrse to latrorse-extrorse, versatile or not, dehiscing by longitudinal slits; gynoecium composed of 1–5 (–8) carpels, these (if more than 1) weakly to firmly united (sometimes only by styles), rarely free, sometimes forming a plurilocular ovary with axile placentation, the ovules solitary (less often paired) in carpels or locules, anatropous (epitropous), apical to basal, the styles free or united (or essentially none), the stigma(s) usually capitate or punctiform; fruit a capsule, schizocarp, or samara, infrequently a drupe (as in our genera) or berry, the embryo straight or curved, the cotyledons large, the endosperm none or scanty.

DISTRIBUTION: Pantropical, sometimes extending into warm temperate areas, with about 25 genera and 150 species. Some members of the family have medicinal properties and a few have useful timber. Two genera are present in Fiji, one indigenous (and endemic) and monotypic, the other with an introduced and naturalized species.

USEFUL TREATMENTS OF FAMILY: ENGLER, A. *Simarubaceae*. Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 359–405. 1931. NOOTEBOOM, H. P. *Simarubaceae*. Fl. Males. 1. 6: 193–226. 1962.

KEY TO GENERA

Leaves simple; flowers 4- or 5-merous, the stamens or staminodes twice as many as petals; carpel solitary, the stigma sessile, subreniform-discoid; drupe solitary, with a thick, lignose endocarp; indigenous.

1. *Amaroria*

Leaves imparipinnate (leaflets in our species usually 9 or 11); flowers usually 4-merous, the stamens or staminodes as many as petals; carpels usually 4, free or coherent only by style bases, the styles recurved, the stigmas thickened or claviform; mature drupes 1-4, with a hard but comparatively thin endocarp; introduced and naturalized. 2. *Brucea*

1. AMARORIA A. Gray in Proc. Amer. Acad. Arts 3: 51. 1853, Bot. U. S. Expl. Exped. 1: 356. 1854; Seem. Fl. Vit. 34. 1865; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 394. 1931; A. C. Sm. in J. Arnold Arb. 36: 279. 1955, in Allertonia 1: 405. 1978.

Dioecious, estipulate tree; leaves alternate, usually congested near apices of branchlets, simple, long-petiolate, the blades pinnate-nerved, entire; inflorescences axillary, narrowly paniculate, with few-flowered lateral cymes or fascicles, minutely bracteate, the ♂ much longer than the ♀, the flowers rarely single on rachis (♀ more frequently than ♂); flowers pedicellate (♂ pedicels longer than ♀); sepals 4 or 5 (very rarely a sixth one partially or completely developed), narrowly imbricate at base in bud; petals 4 or 5, not basally contiguous even in bud; disk intrastaminal, in ♂ flowers large, semiglobose, rounded or slightly depressed at apex but usually without trace of a pistillode (rarely with a minute embedded pistillode), deeply 4- or 5-lobed, each lobe emarginate, the 8 or 10 lobes bluntly obtuse; stamens 8 or 10 (very rarely 9 or 11 but the odd stamen only partially developed), the filaments terete, carnose, slightly narrowed at apex, the inner (antesepalous) filaments surrounded by the deeper disk clefts, the outer (antepetalous) filaments affixed in the shallower disk crenations, the anthers ovoid-oblong, dorsifixed near base, not versatile, the thecae discrete, slightly divergent proximally, dehiscent extrorse-laterally; disk in ♀ flowers shallowly cupuliform, 8- or 10-crenate; staminodes 8 or 10, minute, clavate, semi-immersed in disk crenations, the filaments slender and subequal in length to the obovoid, sterile anthers; gynoecium 1-carpellate, the ovary sessile within disk, carnose, ovoid to subglobose, the ovule lateral, attached slightly above middle and slightly dependent, the stigma sessile, carnose, subreniform-discoid; fruits drupaceous, the epicarp thin, crustaceous, smooth, the mesocarp thin-carnose, the endocarp lignose, thick, the seed with a membranaceous testa, longitudinally ridged when dry, the cotyledons flat, fleshy.

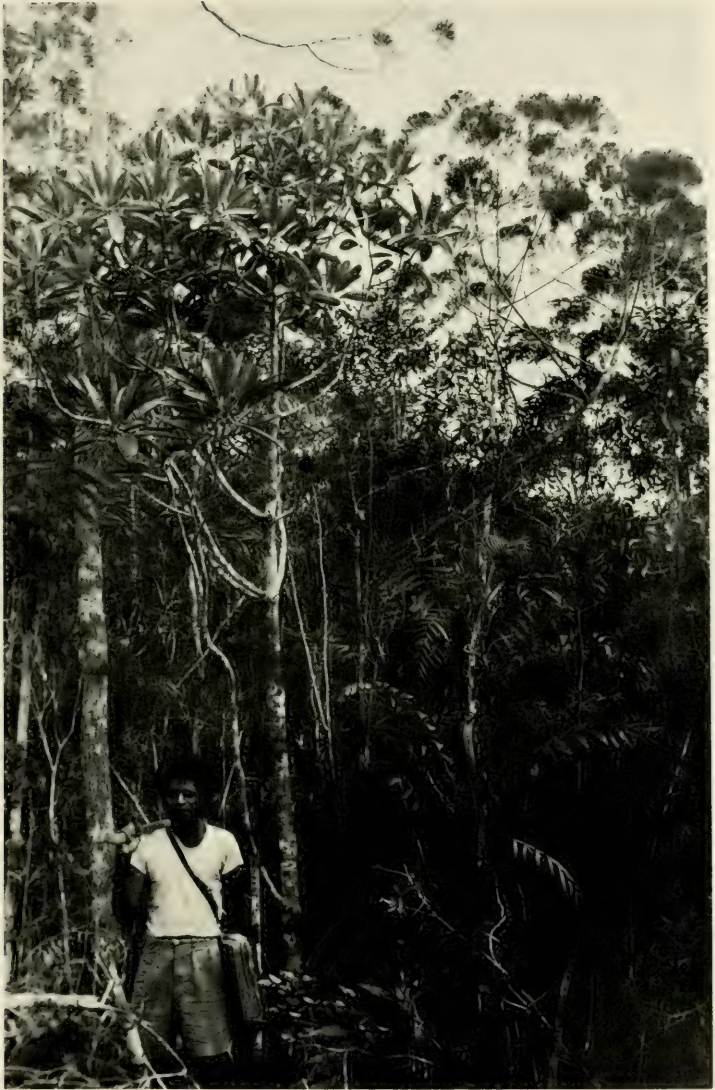
TYPE SPECIES: *Amaroria soulameoides* A. Gray.

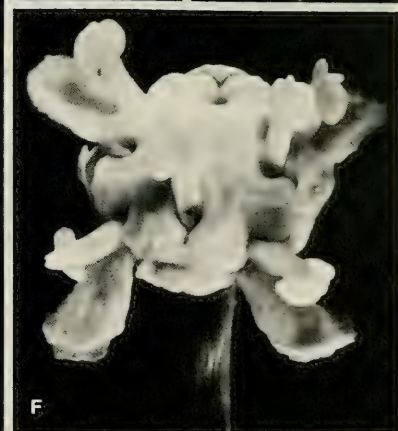
DISTRIBUTION: Endemic to Fiji and monotypic.

Amaroria appears well separated at the generic level from *Soulamea* Lam. by its strictly dioecious habit, its 4- or 5-merous (rather than predominantly 3-merous) flowers, its solitary carpel, and its unwinged fruit with a thick, woody endocarp and a persistent, solitary, strictly terminal stigma. It may be noted that 3-merous flowers very rarely occur in *Amaroria* (e. g. Gillespie 4436, from Ovalau, has a few 3-merous flowers among normal 4-merous ones); in *Soulamea* 3-merous flowers are the rule, but perhaps rare 4- or 5-merous ones may be anticipated.

Engler (1931, cited above) and Nooteboom (annotation on specimen) accredit *Soulamea amara* Lam. to Fiji on the basis of a single specimen, Barclay (κ), labelled as from Nukulau Island, Rewa Province. Discussing this specimen in 1978 (cited above) I suggested that the detached fruit (definitely representing *Soulamea amara*) did not

FIGURE 107. *Amaroria soulameoides* from Mathuata Province, Vanua Levu, from Smith 6649, a ♀ specimen on which fruits can be seen among the terminal clusters of leaves on the typically ascending, slender branches. The tree to the right, with feathery ultimate branchlets, is *Gymnostoma vitiensis* (Casuarinaceae; cf. this *Flora*, vol. 2, p. 254). The palm fronds at the right represent *Balaka seemanii* (cf. this *Flora*, vol. 1, p. 421).





belong with the vegetative portion of the specimen. At my request M. J. E. Coode has kindly reexamined the Barclay specimen and has found that its flowers (σ and 3-merous) and foliage do, however, represent *Soulamea amara*; therefore my suggestion of 1978 was inaccurate. However, further consideration shows that *Barclay* is the only reputedly Fijian specimen referable to *Soulamea amara*, otherwise unknown east of the New Hebrides and the Caroline and Marshall Islands. There are no other Fijian collections of *Soulamea amara*, nor are there any "seashore" specimens of *Amaroria soulameoides*, a species of interior forest that may rarely occur in essentially sea level woodlands but never littorally.

A clue to this situation is provided by Seemann (Fl. Vit. 34. 1865), who implies that Barclay's allegedly Fijian specimen is actually from New Ireland and is part of the type material of *Cardiophora hindsii* Benth. (in J. Bot. 2: 216. 1843). This latter species was subsequently and correctly reduced to *Soulamea amara* by Bentham himself (Bot. Voy. Sulphur, 181. 1846). *Cardiophora hindsii* was based on material collected by both Hinds and Barclay on New Ireland; both collections were listed in 1843, and both were presumably at κ in 1846 (*Hinds* in Herb. Benth., *Barclay* in Herb. Hook.; op. cit. 182). However, no such Barclay specimen from New Ireland can now be located at κ (Coode in litt.), and the logical explanation is that the Barclay specimen labelled as from Fiji is actually from New Ireland, the Fijian label having been inadvertently added at a date later than 1846.

In view of the abundant material of *Amaroria soulameoides* now available, new generic and specific descriptions appear desirable, to amplify the original analysis of σ flowers, dimensions, and other aspects of the taxon.

1. ***Amaroria soulameoides*** A. Gray in Proc. Amer. Acad. Arts 3: 51. 1853, Bot. U. S. Expl. Exped. 1: 356. 1854, Atlas, pl. 40. 1856; Seem. in Bonplandia 10: 296. 1862, Viti, 435. 1862, Fl. Vit. 34. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 135. 1890; Gibbs in J. Linn. Soc. Bot. 39: 143. 1909; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 394. fig. 183, K-O. 1931; A. C. Sm. in J. Arnold Arb. 36: 279. 1955; J. W. Parham, Pl. Fiji Isl. ed. 2. 236. fig. 69. 1972; A. C. Sm. in Allertonia 1: 406. 1978.

FIGURES 107-110.

Soulamea soulameoides Nooteb. in Fl. Males. 1. 6: 221. 1962; J. W. Parham, Pl. Fiji Isl. 167. 1964.

Strictly dioecious tree 2-15 (-20) m. high, with a trunk usually slender and up to 25 cm. in diameter, with comparatively few and subscenting branches, occurring at elevations from near sea level to 1,100 m. in dense, dry, open, or secondary forest, or sometimes in forest on crests and ridges; young parts copiously fine-strigose with golden to brownish hairs, glabrescent or with subsistent indument on vegetative and inflorescence parts; leaves scattered or more often congested on ultimate branchlets, these 5-12 mm. in diameter and often copiously cicatricose below congested foliage; petioles (2-) 3-12 cm. long, slightly swollen at base and apex, 1.5-3 mm. in diameter, subterete, distally inconspicuously canaliculate or flattened adaxially; leaf blades coriaceous or thick-chartaceous, narrowly elliptic to lanceolate-oblong, (7-) 12-27 cm. long, (3-) 4-10 cm. broad, acute and short-decurrent on petiole at base, acute to obtuse or minutely emarginate at apex, the costa shallowly canaliculate above, prominent beneath, the secondary nerves (15-) 20-27 per side, spreading, slightly

FIGURE 108. *Amaroria soulameoides*: A, distal portion of branchlet, with foliage and σ inflorescences, \times 1/4; B-F, σ flowers showing variability, all \times 10; B, 4-merous bud, with 1 sepal, 2 petals, and 3 stamens removed; C, 4-merous bud; D, 5-merous bud; E, 4-merous flower; F, 4-merous flower, with 2 antesepalous stamens removed. A from *Smith 957*, B from *Smith 8431*, C & E from *DA 14524*, D from *Smith 7339*, F from *St. John 18960*.

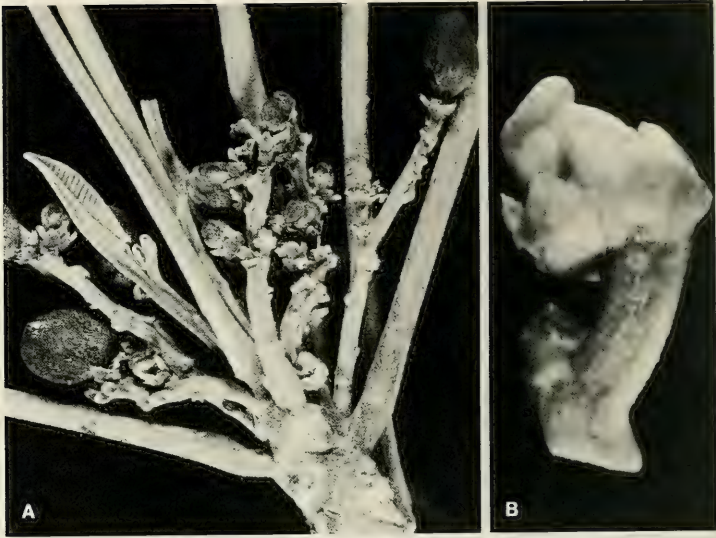


FIGURE 109. *Amaroria soulameoides*; A, ♀ inflorescences, some with developing fruits, congested at apex of branchlet among petioles, $\times 2$; B, 4-merous ♀ flower with developing carpel, $\times 10$. A from *Smith 9221*, B from *Smith 6649*.

curved, slightly elevated above and strongly so beneath, obvious intermediate tertiary nerves often present, the veinlet reticulation copious, fine (ultimate areoles 0.3–0.5 mm. in diameter), prominulous on both surfaces or obscure above, an intramarginal nerve distinct, sinuate-crenate, 0.5–4 mm. within margin; inflorescences several-many-flowered, the ♂ (4–) 6–40 cm. long at anthesis, the ♀ 2–8 cm. long at anthesis and usually with 5–10 flowers, the bracts deltoid, 0.5–1 mm. long, acute; flowers with pale green or yellow-green perianth parts, the ♂ with pedicels 3–15 mm. long and 0.4–1.2 mm. in diameter, the ♀ with pedicels 1–5 mm. long and 1–1.4 mm. in diameter; sepals oblong- or deltoid-ovate, subcarinose especially proximally, 1–2.5 (–3.5) mm. long, 1–2.2 (–3.3) mm. broad, subacute or obtuse at apex; petals ligulate to oblong or oblanceolate-obovate, spreading or reflexed at anthesis, 1.2–3 mm. long, 0.4–1.7 mm. broad, narrowed at base, obtuse or rounded and slightly cucullate at apex, flat or slightly incurved at margin, glabrous on both sides or sometimes short-strigillose along midline within; ♂ flowers with the disk 1.2–2 mm. high and 2–4 mm. broad, the filaments 1–1.8 mm. long, the anthers 0.7–1 mm. long and broad; ♀ flowers with the disk 0.8–1 mm. high and 2–3 mm. broad, the staminodes 0.5–0.8 mm. long, the ovary at anthesis 1.5–3 \times 2–3 mm., the stigma 2–3 mm. in diameter and about 1 mm. thick; fruiting inflorescences 2–10 cm. long and usually with 2–7 fruits, the fruiting pedicels incassate, 4–10 mm. long, the perianth parts occasionally persistent, the disk obscure; mature fruits ovoid or subglobose, slightly laterally compressed, sometimes inconspicuously carinate, greenish yellow to yellow, becoming white and often pink-tinged, (17–) 22–30 \times (13–) 18–25 \times (11–) 15–20 mm., obtuse at base and apex, the stigma persistent, incassate, 3–6 mm. in diameter, the mesocarp scarcely 0.5 mm. thick, the endocarp 4–7 mm. thick.

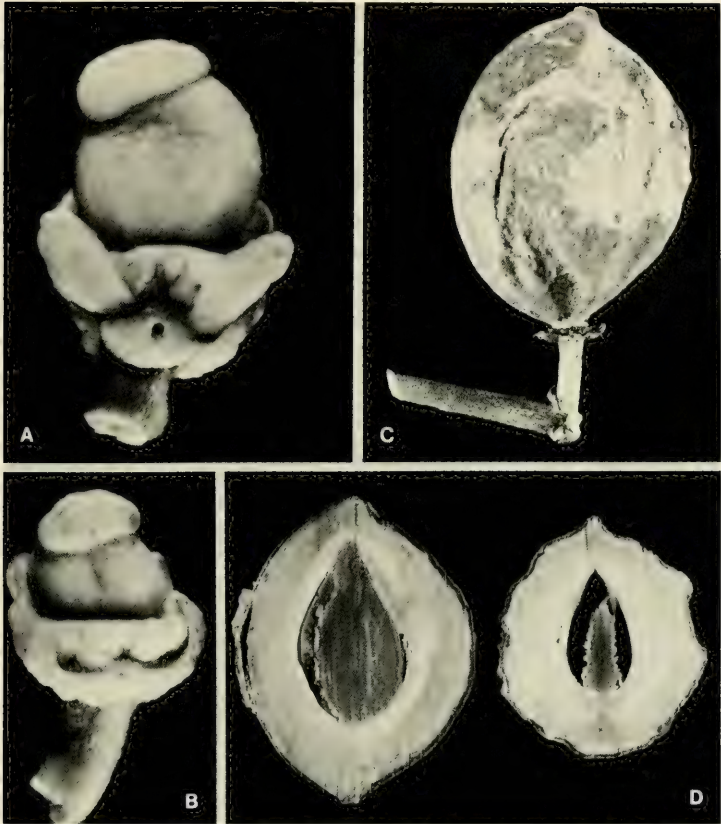


FIGURE 110. *Amaroria soulameoides*; A, 4-merous ♀ flower with maturing carpel, with 1 sepal removed to show disk and an antesepalous staminode, × 10; B, 4-merous ♀ flower with 1 sepal and 2 petals removed to show disk and 3 staminodes, × 10; C, mature fruit, × 2; D, longitudinal (left) and cross (right) sections of mature fruit, × 2. A from *Smith 9221*, B from *Smith 6649*, C from *Parks 20750*, D from *St. John 18958* (left) and *DA 16521* (right).

TYPIFICATION: The type is *U. S. Expl. Exped.* (US 417 HOLOTYPE; ISOTYPES at GH, K), collected in 1840 in the mountains of Mathuata Province, Vanua Levu. Gray was uncertain whether his new genus (first published as part of a descriptio generico-specifica) was monoecious or dioecious, but in fact it is strictly dioecious. The type material bears ♀ inflorescences and accompanying fruits. Gray based his description and illustrations (*pl. 40, fig. 1-5*) of the ♂ flowers on sketches made under Rich's supervision; such flowers must have been taken from a different individual, but the

sketches are inaccurate in showing six sepals, no petals, and only six stamens (three of the sepals could be construed as petals, but 3-merous flowers are extremely rare in *Amaroria*, as noted above, and it seems unlikely that Rich by chance would have found one such flower).

DISTRIBUTION: Endemic to Fiji and thus far known from six islands, including two in the Lau Group. About 95 specimens have been studied. The species is one of the most abundant small trees of the Fijian forest, most frequently observed in fairly dry areas. It occurs only infrequently near sea level, quite unlike the littoral *Soulamea amara* Lam. in Malesia and Micronesia.

LOCAL NAMES AND USES: The most frequently used names are *vasa ni veikau* and *vutu kalou*; other names recorded only once or twice and perhaps not reliable are *teinivia*, *masawe*, and *sasawira* (Mba), *katakai* and *mbulei* (Nandronga & Navosa), *mbau* (Serua), *mbuambua elewa* (Namosi), *lairua* (Naitasiri), and *ngaingai* (Vanua Mbalavu). The timber is used locally in house building, and a medicinal use noted in Nandronga & Navosa suggests that juice from grated roots may be used as a remedy for sore eyes. Several collectors have noted that the fruits are eaten by pigeons and bats.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mt. Evans Range, *Greenwood 1255*; upper slopes of Mt. Koromba, *Smith 4651*; between Nandarivatu and Waikumbukumbu, *Gibbs 692*; vicinity of Nandarivatu, *Parks 20750*. NANDRONGA & NAVOSA: Nausori Highlands, *O. & I. Degener 32157A*; northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, *Smith 5664*; north of Komave, *St. John 18958, 18960*. SERUA: Mbuyombuyo, near Namboutini, *Tabualewa 15579*; hills west of Waivunu Creek, between Ngaloa and Korovou, *Smith 9221*. NAMOSI: Mt. Naitarandamu, *Gillespie 3442*; hills north of Wainavindrau Creek, between Korombasambasanga Range and Mt. Naitarandamu, *Smith 8431*; vicinity of Lomba, *Howard 3*. NAITASIRE: Tholo-i-suva, *DA 14524*; Savura Creek, *DA 12526*; vicinity of Tamavua, *Gillespie 2459*. TAILEVU: Taillevu road, *DA 227*. REWA: Mt. Korombamba, *DA 16521*. OVALAU: Hills east of Lovoni Valley, *Smith 7339*; above Levuka reservoir, *Gillespie 4531*. KORO: Eastern slope of main ridge, *Smith 957*. VANUA LEVU: MBUA: Above Thongea, Wainunu River, *DA 15799*. MATHUATA: Near Mbasakalave, Ndreketi district, *Stauffer & Kuruvoli 5846*; Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, *Smith 6649*. THAKAUNDRÖVE-MATHUATA boundary: Crest of Korotini Range, between Navitho Pass and Mt. Ndelaikoro, *Smith 565*. THAKAUNDRÖVE: Eastern drainage of Yanawai River, *Degener & Ordenez 14079*. MOALA: Ndelaimoala, *Smith 1360*. VANUA MBALAVU: Nambavatu, northern limestone section, *Tothill 57a*.

2. BRUCEA J. F. Mill. *Icon. Animal. Pl. t. 25. 1779 or 1780*; Engl. in Engl. & Prantl, *Nat. Pflanzenfam. ed. 2. 19a*: 386. 1931; A. C. Sm. in J. Arnold *Arb. 36*: 280. 1955; Nooteb. in *Fl. Males. I. 6*: 209. 1962. *Nom. cons.*

Monococious or dioecious small trees or shrubs, estipulate, the young parts pilose; leaves imparipinnate, the leaflets 3-15, with obliquely ovate to lanceolate blades; inflorescences axillary, narrowly cymose-paniculate; flowers ♂ or unisexual, (3-)-4(-5)-merous; calyx small, deeply lobed, the lobes imbricate in bud; petals ovate-oblong to linear, imbricate in bud, small but longer than disk; disk cupuliform, lobed, glabrous; stamens or staminodes as many as petals, the filaments short, without a basal scale, the anthers ovate, cordate at base, lacking or vestigial in ♀ flowers; ovaries usually 4, free, glabrous (rudimentary and lacking styles in ♂ flowers), 1-ovuled, the ovule dependent, attached above middle, the styles free or basally coherent, recurved, short, the stigma thickened or claviform; fruit composed of 1-5 drupes (usually 4), these spreading, ellipsoid or ovoid, with a terminal stylar scar.

TYPE SPECIES: *Brucea antidysenterica* J. F. Mill.

DISTRIBUTION: Tropical Africa and Asia into Malesia and northern Australia, with four or more species, one of which has become locally naturalized in Fiji.

1. *Brucea javanica* (L.) Merr. in J. Arnold Arb. 9: 3, pl. 10. 1928; A. C. Sm. in op. cit. 36: 280. 1955; Nooteb. in Fl. Males. I. 6: 211, fig. 12, a-d. 1962; J. W. Parham, Pl. Fiji Isl. 167. 1964, ed. 2. 236. 1972.

Rhus javanica L. Sp. Pl. 265. 1753.

Brucea sumatrana Roxb. Hort. Beng. 12, nomen. 1814, Fl. Ind. ed. 2. 1: 449. 1832; J. W. Parham in Dept. Agr. Fiji Bull. 35: 98. 1959.

As noted in Fiji, *Brucea javanica* is an often simple-stemmed shrub or small tree 1-4 m. high, locally naturalized at elevations from near sea level to about 300 m. in light forest, thickets, or coconut plantations, or on edges of clearings. Its leaves, up to 50 cm. long, have 9 or 11 leaflets (3-15 elsewhere) with blades predominantly ovate, up to 14 × 5 cm., and coarsely serrate. The attractive small flowers have the sepals and petals rich purple and the gynoecium pale green, with purple-tinged styles. The drupes (usually 1-3 per flower maturing) change from green through blue and at maturity become purple or black. Flowers and fruits have been noted in months between August and March.

TYPIFICATION: The type of *Rhus javanica* is *Osbeck* (LINN HOLOTYPE), collected on Dane's Island, near Whampoa, southeastern China (rather than Java, where *Osbeck* collected only briefly, cf. Merrill, 1928). *Brucea sumatrana* is based on *Lussa radja* Rumph. (Herb. Amb. Auctuar. 27. t. 15. 1755). Nootboom (1962) cites several additional synonyms.

DISTRIBUTION: Ceylon through southeastern Asia to southern China and Taiwan and throughout Malesia to northern Australia; introduced into Ponape, Fiji, and perhaps elsewhere. It has apparently escaped from cultivation in Fiji and is now well naturalized at least on Taveuni. Parham (1959) mentioned it as a weed of coconut plantations, but it scarcely seems abundant or troublesome enough to be considered weedy.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Nasinu, DA 13227. TAVEUNI: Slopes of Mt. Manuka, east of Wairiki, Smith 8182; Waitavala Estate, DA 8907, 15851; Songgulu Estate, DA 11508; without locality (edge of clearings in coconut plantations), Gillespie 4671.

FAMILY 136. SURIANACEAE

SURIANACEAE Arn. in Wight & Arn. Prodr. Fl. Ind. Orient. 360, as *Surianeae*. 1834.

Shrub or small tree, stipulate, often copiously gray-pilose, sometimes with glandular-capitate hairs, lacking bitter bark; leaves alternate, congested, small, simple, the petioles essentially none, the blades entire; inflorescences cymose, few (or 1)-flowered, persistently bracteate, the bracts foliaceous; flowers actinomorphic, ♀, 5-merous; calyx deeply lobed, persistent, the lobes imbricate in bud; petals free, imbricate, unguiculate, slightly shorter than calyx lobes, fugacious; disk lacking; stamens 10, biseriate (5 sometimes sterile), the filaments subulate, the anthers 2-locular, dorsifixed, laterosely dehiscent by longitudinal slits; carpels 5, free, the ovules 2 per carpel, basal, collateral, amphitropous, the styles free, filiform, gynobasic, the stigmas small, inconspicuous; fruits drupaceous, free, 3-5 drupes developing and enclosed by calyx, the seed solitary, the embryo curved, the endosperm lacking.

DISTRIBUTION: A monotypic, pantropical family.

USEFUL TREATMENT OF FAMILY: GUTZWILLER, M.-A. Die phylogenetische Stellung von *Suriana maritima* L. Bot. Jahrb. 81: 1-49. 1961.

Nootboom (in Fl. Males. I. 6: 195. 1962) has briefly noted the taxonomic history of *Suriana*, agreeing with the frequently held opinion that the genus is best placed in Simaroubaceae, although its distinctness is then often emphasized by recognizing it at some level such as a subfamily. Engler (in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a:

367-369. 1931) associates *Suriana* with the genera *Cadellia* F. v. Muell., *Guilfoylia* F. v. Muell., and *Rigiostachys* Planch. in a subfamily Surianoideae. The most thorough study of *Suriana* seems to have been that of Gutzwiller (1961, cited above), who gives reasons for dissociating it from the other three mentioned genera and also from the family Simaroubaceae. She concludes that *Suriana* is to be considered an isolated member of the Geraniales (sensu lat.) with characters suggestive of Connaraceae, Chrysobalanaceae, and Sapindaceae. Such a ranking and approximate position have been adopted by several current treatments and is reflected in the modified Bentham and Hooker sequence now utilized in such herbaria as κ and BM.

1. *SURIANA* L. Sp. Pl. 284. 1753; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **19a**: 367. 1931; Nooteb. in Fl. Males. I. **6**: 196. 1962; Coode in Fl. Masc. Fam. 66, 1. 1979.

Characters of the family.

TYPE SPECIES: *Suriana maritima* L.

DISTRIBUTION: Pantropical but erratic in distribution, absent from western Africa, continental Asia, and Hawaii; abundant in calcareous beach habitats in Micronesia and Polynesia, but less frequent in Malesia and Melanesia. The single species is not common in Fiji.

1. *Suriana maritima* L. Sp. Pl. 284. 1753; Seem. Fl. Vit. 34. 1865; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **19a**: 368. fig. 167. 1931; Greenwood in Proc. Linn. Soc. **154**: 95. 1943; Yuncker in Bishop Mus. Bull. **220**: 154. 1959; Nooteb. in Fl. Males. I. **6**: 196. fig. 1. 1962; J. W. Parham, Pl. Fiji Isl. 167. 1964, ed. 2. 236. 1972; Coode in Fl. Masc. Fam. 66, 1. pl. 1. 1979. FIGURE 111.

As it sparingly occurs in Fiji, *Suriana maritima* is found near sea level on sandy calcareous beaches or on rocky cliffs as a shrub or small tree 1-4 m. high, sometimes with a trunk to 8 cm. in diameter. A short, gray, often glandular indument covers most parts of the plant. The sessile, congested leaves have narrowly obovate-oblong blades usually 15-30 × 2-5 mm. The inconspicuous inflorescences bear flowers scarcely 1 cm. long, with lemon-yellow petals shorter than the calyx lobes. The brownish, inconspicuous drupes are concealed by the persistent calyx. Flowers and fruits have been noted between August and February.

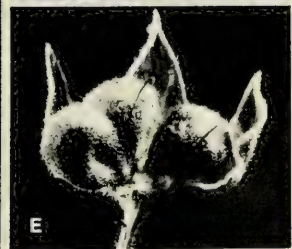
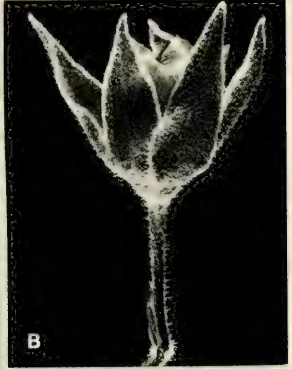
TYPIFICATION: Syntypes (Coode, 1979) may be considered three specimens (LINN) without localities; the species was originally mentioned from Bermuda and Jamaica.

DISTRIBUTION: As noted for the genus.

LOCAL NAME: *Ngingia*; this name is also sometimes used for *Pemphis acidula* (Lythraceae), which *Suriana maritima* superficially resembles in foliage and with which it shares a similar habitat.

AVAILABLE COLLECTIONS: WAILANGILALA: *Tothill 56*. YATHATA: In coconut plantation, *DA 13942*. NAVUTU-I-RA: *Bryan 469*. FULANGA: In beach thickets on limestone formation, *Smith 1228*. Neither Seemann (1865) nor Guppy (Obs. Nat. Pac. 2: 528. 1906) observed *Suriana* in Fiji, although one must assume it to be present on coastal limestone of many small islands. The earliest collections I have seen are those of Bryan and Tothill from the 1920's. In addition to the localities listed above, the species was noted by Greenwood (1943) on Kandavu Lailai islet off the Lautoka coast, Mba Province, Viti Levu, and by Mrs. Tothill (note on *Tothill 56*) on the small islands of Vatulele (south of Viti Levu) and Nayau (Lau Group).

FIGURE 111. *Suriana maritima*, from *Bryan 469*; A, distal portion of branchlet, with foliage, flowers, and fruits, × 2; B, flower, × 4; C, flower with 2 sepals and 2 petals removed, some anthers fallen, × 10; D, gynoecium, with 2 carpels removed, × 20; E, fruiting gynoecium, with 2 drupes removed, × 4.



FAMILY 137. RUTACEAE

RUTACEAE Juss. Gen. Pl. 296. 1789.

Trees or shrubs (seldom herbs), sometimes scandent, often aromatic, often with axillary spines, estipulate; leaves alternate (spirally arranged or less often distichous) or opposite, rarely whorled, pinnately compound (rarely pinnately dissected), 3-foliolate, or 1-foliolate, rarely simple, sometimes with winged petioles, the blades usually obviously pellucid-punctate; inflorescences cymose, racemose, paniculate, or fasciculate, sometimes 1-flowered, the flowers ♂ or unisexual, actinomorphic (rarely slightly zygomorphic), hypogynous (rarely slightly perigynous), most often 4- or 5-merous, the perianth 1- or 2-seriate; calyx shallowly to deeply lobed, the lobes or distinct sepals usually imbricate; petals normally as many as and alternate with calyx lobes, usually free, imbricate or valvate, rarely lacking; disk intrastaminal, annular to pulvinate, cupuliform, or cylindrical; stamens commonly twice as many as petals, sometimes as many, sometimes up to 60, free or with filaments coherent in phalanges, the anthers 2-celled, introrse, dehiscent by longitudinal slits, the connective often glandular at apex; gynoecium composed of (1-) 4 or 5 (-many) carpels, these sometimes free but then usually with coherent styles, sometimes partially united, sometimes completely united into a plurilocular ovary with axile placentation (placentation rarely intruded-parietal in a 1-locular ovary), the ovules 1-many (often 2) per carpel or locule, superposed or collateral, sometimes in 2 or more longitudinal rows, anatropous or hemitropous (usually distinctly epitropous), the styles free, coherent, or united, the stigma small or often capitate; fruit diverse, a follicetum, capsule, schizocarp, drupe, or berry, the seeds with straight or curved embryos, sometimes polyembryonic, with or without endosperm.

DISTRIBUTION: Pantropical and subtropical but extending into temperate areas, with about 150 genera and at least 1,500 species. Twelve genera are recorded in Fiji, five of them with indigenous species.

USEFUL TREATMENTS OF FAMILY: ENGLER, A. Rutaceae. Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 187-359. 1931. SWINGLE, W. T. The botany of Citrus and its wild relatives of the orange subfamily (family Rutaceae, subfamily Aurantioideae). In: Webber, H. J., & L. D. Batchelor. The Citrus Industry 1: 129-474. 1943. SMITH, A. C. Studies of Pacific Island plants, IX. Notes on the Rutaceae of Fiji, Samoa, and Tonga. J. Arnold Arb. 32: 226-255. 1951.

The Rutaceae are an important family for edible fruits (*Citrus* and related genera), while various taxa have ornamental or medicinal uses.

KEY TO GENERA

Ovary deeply lobed or carpels separate, the lobes or separate ovaries often united by styles; stamens as many as or twice as many as petals; fruits follicular or capsular, loculicidally dehiscent (at least apically), mostly with a free endocarp, the follicles or cocci 1- or 2-seeded, the seeds with endosperm.

Leaves alternate, the leaflets (in our species) 2-8 pairs; flowers unisexual (rarely ♂), the perianth (in our species) biseriolate, the stamens as many as petals; fruits follicular; indigenous species.

1. *Zanthoxylum*

Leaves opposite, (in our species) 3- or 1-foliolate; flowers functionally unisexual or ♂; fruits follicular or capsular.

Seeds dull to slightly lustrous, minutely roughened, discharged with the endocarp when the follicle dehisces; fruits follicular; inflorescences axillary; flowers ♂, 4-merous; stamens 4; ovary with 2-ovulate locules; one presumably aboriginally introduced species in Fiji. 2. *Euodia*

Seeds smooth, black, shiny, remaining attached in the dehiscent fruits; fruits follicular to capsular; inflorescences (in our species) axillary or borne on branchlets below leaves; flowers functionally unisexual or rarely ♂, 4-merous; stamens 4 or 8; ovary with 2-ovulate locules (these 1-ovulate in a single Fijian species); indigenous species. 3. *Melicope*

Ovary entire or shallowly lobed (in our representatives but sometimes the gynoecium subapocarpous in other species of genus no. 4), the styles united; stamens twice as many as petals or more; fruits indehiscent, drupaceous or baccate.

Fruit a 4-locular drupe, with 1 or 2 seeds per locule, the seeds with fleshy endosperm; gynoecium a 4-locular pistil, each locule with 2 ovules; leaves opposite (rarely ternate), 1-foliolate; plants dioecious, the flowers functionally unisexual, 4-merous, with 8 distinct stamens, the sepals and petals persistent in fruit; indigenous species. 4. *Sarcomelicope*

Fruit a berry, dry or juicy, sometimes a hesperidium with a tough rind, sometimes with a woody rind, the seeds 1-many, without endosperm, sometimes polyembryonic; gynoecium a (rarely incompletely) 2-many-locular pistil, each locule with 1-numerous ovules; leaves alternate (usually spirally arranged, less often distichous), imparipinnate, 3- or 1-foliolate, or simple; plants with ♀ flowers or these sometimes ♂ by partial or complete abortion of pistil.

Branchlets without axillary spines; leaves usually imparipinnate and with leaflets alternate on the nonarticulated rachis, rarely 3- or 1-foliolate (but not in our species), the rachis not breaking into segments when leaves fall; ovary 2-5(-6)-locular, with 1 or 2 ovules per locule; fruits small, dry or juicy berries, without pulp vesicles in the locules.

Petals valvate; ovary locules each with 2 superposed ovules, their radial walls curved or twisted; cotyledons thin, folded; indigenous species. 5. *Micromelum*

Petals imbricate; ovary locules each with 2 superposed or subcollateral ovules (sometimes with a single ovule), their radial walls not curved or twisted; cotyledons thick, plano-convex; cultivated and sometimes naturalized species. 6. *Murraya*

Branchlets with single or paired spines (except in *Wenzelia*); leaves often imparipinnate and with leaflets opposite on the articulated rachis, or 3- or 1-foliolate or simple, the rachis if present breaking into segments when leaves fall; ovary 2-5-locular with 1-8 ovules per locule or 6-20-locular with 4-many ovules per locule; fruits comparatively large and (except in *Triphasia*) with a well-developed peel or hard shell, often with pulp vesicles that enlarge and fill the cavity.

Fruits not hard-shelled, sometimes with a somewhat coriaceous rind (but then the seeds glabrous). Stamens twice as many as petals; fruits small (1-5 cm. in diameter), the locules without pulp vesicles but usually containing mucilaginous gum; leaves simple or 3-foliolate.

Ovules 1 or 2 in each ovary locule; leaves 3-foliolate (as in our species) or simple; spines paired; cultivated and naturalized species. 7. *Triphasia*

Ovules 4-8 (usually 6) in each ovary locule; leaves simple; our species lacking spines, indigenous. 8. *Wenzelia*

Stamens 2-4 or more times as many as petals, often cohering laterally in phalanges; fruits often large (2-20 cm. or more in diameter), the locule walls bearing sessile or stalked pulp vesicles filled with juicy tissue; leaves 1-foliolate.

Ovary with 8-18 (usually 10-14) locules, each with 4-12 ovules; stamens 4-8 (-10) times as many as petals; stigma with small oil glands; cultivated and naturalized species. . . . 9. *Citrus*

Ovary with 3-7 locules, each with 2 ovules; stamens 3-4 times as many as petals; stigma cavernous, with large, deep-seated oil glands; cultivated species only. . . . 10. *Fortunella*

Fruits large (4-8 (-15) cm. in diameter), with a thick, hard, woody rind.

Leaves 3-foliolate; stamens 6-10 times as many as petals; ovary with 8-20 locules, each with numerous ovules in 2 rows; fruits with 8-20 segments, the seeds woolly, embedded in transparent, glutinous gum; cultivated and sparingly naturalized species. 11. *Aegle*

Leaves 5- or 7-foliolate; stamens about twice as many as petals; ovary incompletely 4-6-locular, becoming 1-locular with 4-6 parietal placentae, the ovules numerous, in several series at angles of incomplete ovary walls; fruits with a single cavity with parietal placentae, bearing numerous, pilose seeds surrounded by gumlike pulp; cultivated species only.

12. *Limonia*

1. ZANTHOXYLUM L. Sp. Pl. 270. 1753; T. Hartley in J. Arnold Arb. 47: 173. 1966.

Fagara L. Syst. Nat. ed. 10. 897. 1759; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 217. 1931; A. C. Sm. in J. Arnold Arb. 32: 227. 1951; Backer & Bakh. f. Fl. Java 2: 96. 1965. Nom. cons. non nisi vs. *Fagara* Duhamel (1755).

Xanthoxylum Mill. Gard. Dict. ed. 8, orth. var. 1768; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 214. 1931.

Blackburnia J. R. & G. Forst. Char. Gen. Pl. 6. 1775, ed. 2. 11. 1776.

Zanthoxylon Walt. Fl. Carol. 52, 243, orth. var. 1788.

Xanthoxylon Spreng. Anl. Kenntn. Gew. ed. 2. 655, orth. var. 1818.

Dioecious or rarely monoecious shrubs or trees, often aculeate (but not our species), sometimes scandent; leaves alternate, imparipinnate, paripinnate, or 3-foliolate (rarely 1-foliolate), the rachis terete (or canaliculate) or winged, the leaflets up to 15 pairs, opposite or alternate, sessile or short-petiolulate, the proximal ones often reduced in size, the blades usually inaequilateral, often pellucid-glandular, entire to crenate; inflorescences axillary or terminal, racemose, paniculate, or cymose, the ultimate branchlets sometimes bearing solitary flowers (pedicel = portion distal to ultimate articulation); flowers small, unisexual (rarely ♀), sessile or pedicellate; perianth composed of 6-8 irregularly uniseriate, undifferentiated segments or (as in

our species) biseriate, the calyx lobes and petals each 4 (as in our species) or 5; disk inconspicuous, flat or pulvinate; stamens (3-) 4-6, uniseriate, free, opposite calyx lobes (rudimentary or lacking in ♀ flowers), the anthers medifixed; gynoecium of 1-5 carpels (rudimentary or lacking in ♂ flowers), the ovaries free or proximally connate, each with 2 collateral, pendulous ovules, the styles coherent or divergent, the stigmas capitate, coherent or free; fruit a follicetum, the follicles 1-5 (in our species apparently always 1), free or proximally connate, 1-seeded, the exocarp glandular, red to black, the endocarp cartilaginous, stramineous, the seeds ovoid to globose, often dependent by a funicle, the testa black to reddish, crustaceous, nitid.

LECTOTYPE SPECIES: The lectotype species of *Zanthoxylum* (ING, 1979) is *Z. fraxineum* Willd. (Sp. Pl. 4: 757. 1806) (vide Fosberg in Taxon 8: 105. 1959). *Fagara* is typified by *F. pterota* L. (typ. cons.); *Fagara* is not conserved against *Zanthoxylum*, the name to be used by those who combine the genera. The type species of *Blackburnia* is *B. pinnata* J. R. & G. Forst. (= *Zanthoxylum pinnatum* (J. R. & G. Forst.) W. Oliver). For summarizing discussions of the various viewpoints that have been espoused, the reader is referred to papers by Fosberg (in Taxon 7: 94-96. 1958, in op. cit. 8: 103-105. 1959) and Waterman (in op. cit. 24: 361-366. 1975).

DISTRIBUTION: Pantropical, extending northward into temperate Asia and America, with 200-300 species. Although four species are indigenous in Fiji, three of them being endemic, individual plants appear scattered and collections are few.

USEFUL TREATMENT OF GENUS: HARTLEY, T. G. A revision of the Malesian species of *Zanthoxylum* (Rutaceae). J. Arnold Arb. 47: 171-221. 1966.

KEY TO SPECIES

- Leaflets (2-) 3-6 pairs, the blades entire or essentially so, obviously inaequilateral at base; flowers and fruits distinctly pedicellate; calyx shallowly lobed, the lobes without large central glands; fruits 12-15 × 8-11 mm. (before dehiscence).
- Leaves 10-27 cm. long, the petiole (2-) 3-5 (-7) cm. long; leaflet blades chartaceous to thin-coriaceous, more or less translucent when dried, the venation obvious on both surfaces, the margins plane or very narrowly recurved, the largest blades (on a leaf) 5-9 × 3-4 cm., slenderly long-acuminate to cuspidate (apex 3-15 mm. long); pedicels (above ultimate articulation) in flower and fruit 3-9 mm. long; fruits 12-15 × 8-10 mm. (before dehiscence), narrowed proximally to an obconical stipe 1-2 mm. long. 1. *Z. pinnatum*
- Leaves 8-13 cm. long, the petiole 1.5-3 cm. long; leaflet blades coriaceous, opaque, the venation inconspicuous or immersed on both surfaces, the margins strongly revolute, the largest blades (on a leaf) 4-6 × 2-3.2 cm., obtusely short-cuspidate (apex broad, 2-5 mm. long); pedicels (above ultimate articulation) in fruit 2.5-4 mm. long; fruits 12-14 × 8-11 mm. (before dehiscence), rounded at base. 2. *Z. gillespieanum*
- Leaflets 6-10 pairs, the blades crenulate at margin, the indentations marked by glands, the base only slightly inaequilateral; flowers sessile in ultimate clusters of 2 or 3; calyx deeply lobed, each lobe with a large, immersed gland in its center.
- Leaves 18-30 cm. long, the petiole (1.5-6 cm. long) and rachis obviously canaliculate; petiolules 3-7 mm. long; leaflet blades (largest on a leaf) 5-8 × 2-3 cm.; fruits 8-10 × 6-8 mm. (before dehiscence), narrowed to a basal stipe about 1 mm. long. 3. *Z. vitiense*
- Leaves 40-65 cm. long, the petiole (10-15 cm. long) and rachis subterete; petiolules 7-12 mm. long; leaflet blades (largest on a leaf) 11-15 × 4-5 cm.; fruits not yet known. 4. *Z. myrianthum*

1. *Zanthoxylum pinnatum* (J. R. & G. Forst.) W. Oliver in Trans. & Proc. New Zealand Inst. 49: 140. (July 6) 1917; Druce in Bot. Soc. Exch. Club Brit. Isles 4: 653. ("July") 1917; A. C. Sm. in Bishop Mus. Bull. 141: 76. 1936; P. Green in J. Arnold Arb. 51: 214, p. p. 1970; A. C. Sm. in Allertonia 1: 407. 1978.

FIGURES 112A, 114A & B.

Blackburnia pinnata J. R. & G. Forst. Char. Gen. Pl. 6. t. 6. 1775, ed. 2. 12. t. 6. 1776.

Ptelea pinnata L. f. Suppl. Pl. 126. 1781.

Zanthoxylum blackburnia Benth. Fl. Austral. 1: 363, nom. illeg. 1863; Burkill in J. Linn. Soc. Bot. 35: 30. 1901.

Fagara pinnata Engl. in Engl. & Prantl, Nat. Pflanzenfam. III. 4: 119. 1896, ed. 2. 19a: 224. 1931; A. C. Sm. in J. Arnold Arb. 32: 227. 1951; Yunker in Bishop Mus. Bull. 220: 151. 1959; J. W. Parham, Pl. Fiji Isl. 166. 1964, ed. 2. 235. 1972.

As seen in the Fijian Region, *Zanthoxylum pinnatum* is an infrequent tree 5–26 m. high, with a trunk up to 25 cm. in diameter, occurring at elevations from near sea level to 200 m. in forest and thickets, often on limestone formation. The flowers have white petals and filaments and yellow anthers; the fruit, as far as noted, is green, and the seed black. Flowers have been obtained in February and May, fruits between March and August.

TYPIFICATION: The type is *J. R. & G. Forster* (BM HOLOTYPE; ISOTYPE at K), collected on Norfolk Island during Cook's second voyage.

DISTRIBUTION: Norfolk and Lord Howe Islands, Fiji, Tonga, and Samoa; doubtfully in the New Hebrides. Only two collections, both in flower, are known from Fiji; some of the data here used is taken from Tongan and Samoan collections.

LOCAL NAME: *Warui* (Fulanga).

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Tholo-i-suva, *Bola 35* (K). FULANGA: On limestone formation, *Smith 1150* (BISH, K, NY, and 8 other depositories).

For the time being I continue to accept the interpretation of *Zanthoxylum pinnatum* presented by Green (1970, cited above), with the exclusion of *Z. gillespieanum*, here retained as a Fijian upland endemic species. However, Green's remarks suggest that it may be desirable still further to divide a concept of *Z. pinnatum* upon examination of more complete material from the archipelagoes between the New Hebrides and Tonga. Taking into consideration the now available collections of this complex from Fiji, Tonga, and Samoa, one may note that in this area the leaflets are 6–12 (–15) per leaf and the petals are 3.5–5 mm. long; in the material from Norfolk and Lord Howe

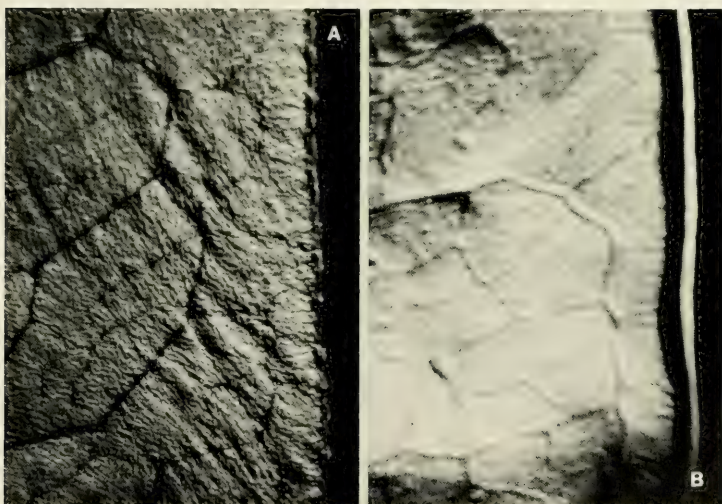


FIGURE 112. A, *Zanthoxylum pinnatum*; portion of lower surface of leaflet blade, $\times 10$. B, *Zanthoxylum gillespieanum*; portion of lower surface of leaflet blade, $\times 10$. A from *Smith 1150*, B from *Smith 5578*.

Islands (Green, 1970), the leaflets are 4-8 per leaf and the petals are 2.7-3 mm. long. Putting aside the questionable collection from the New Hebrides (Green, 1970), it is possible that collections from the Fijian Region should be recognized as a taxon distinct from *Z. pinnatum*. The resulting distributional pattern would then be more in keeping with that seen in other genera of flowering plants, very few species having a range from Norfolk and Lord Howe Islands into the Pacific as far as Samoa except for vagile taxa that also occur in Malesia and New Caledonia. The collections from Fiji, Tonga, and Samoa cannot be assigned to *Z. nadeaudii* Drake, of the Society Islands, which has small, subsessile flowers (pedicels 1-1.5 mm. long) in clusters of 3-several at the ultimate inflorescence nodes, and leaflet texture and margin more like those of *Z. gillespieanum* than of *Z. pinnatum*. New Caledonian collections of the *Z. pinnatum* complex are now satisfactorily separated as *Z. pancheri* P. Green (1970), and immediate relatives are not noted in Malesia including the Solomon Islands (Hartley, 1966).

Specimens of *Zanthoxylum pinnatum* (sensu lat.) of the Fijian Region not cited by Green in 1970 as may be noted as:

TONGA. VAVA'U: Talau hill, *MacDaniels 1093* (BISH); east of Matakī, Niu'a, *Hotta 4946* (BISH).
SAMOA. SAVAI'I: Inland from Auala, *Fasavalu WS17* (BISH).

2. *Zanthoxylum gillespieanum* (A. C. Sm.) A. C. Sm. in *Allertonia* 1: 408. 1978.

FIGURES 112B, 114C.

Fagara gillespieana A. C. Sm. in *J. Arnold Arb.* 32: 228. 1951; *J. W. Parham, Pl. Fiji Isl.* 166. 1964, ed. 2. 234. 1972.

A tree to 20 m. high, occurring in dense forest at elevations of 725-1,120 m. Fruits have been obtained in August and November.

TYPIFICATION: The type is *Smith 5578* (A HOLOTYPE; ISOTYPES at BISH, K, US), collected Aug. 7, 1947, on the northern portion of the Rairaimatuku Plateau, between Nandrau and Nanga, Nandronga & Navosa Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known from only two collections from Viti Levu.

LOCAL NAME: *Totowiwi* (from type collection).

AVAILABLE COLLECTION: VITI LEVU: MBA: Summit ridge of Mt. Nanggaranambuluta, east of Nandarivatu, *Gillespie 3943* (BISH, GH, UC).

3. *Zanthoxylum vitiense* A. C. Sm. in *Bishop Mus. Bull.* 141: 77. fig. 38. 1936, in *Allertonia* 1: 408. 1978.

FIGURE 113A-C.

Fagara vitiensis A. C. Sm. in *J. Arnold Arb.* 32: 229. 1951; *J. W. Parham, Pl. Fiji Isl.* 166. 1964, ed. 2. 235. 1972.

A slender tree 2-6 m. high, occurring at elevations of 430-800 m. on forested slopes and open hillsides, and in the forest and thickets of crests and ridges. The petals and filaments are white, the anthers yellow; the mature follicle is red, with black, shining seeds. Flowers have been obtained in June, fruits in March.

TYPIFICATION: The type is *Smith 1884* (BISH HOLOTYPE; ISOTYPES at GH, K, MAD (transferred from Y), NY, P, and US), collected June 5, 1934, on the eastern buttress of Mt. Ndikeya, Thakaundrove Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and sparingly known only from the two large islands.

LOCAL NAME: *Manawi* (noted from Rewa specimen cited below).

AVAILABLE COLLECTIONS: VITI LEVU: NAMOSI: Mt. Voma, *DA 1732*. NAITASIRI: Mendrausuthu Range, *DA 15483, 17256*. REWA: Mt. Korombamba, *DA*, June 12, 1938.

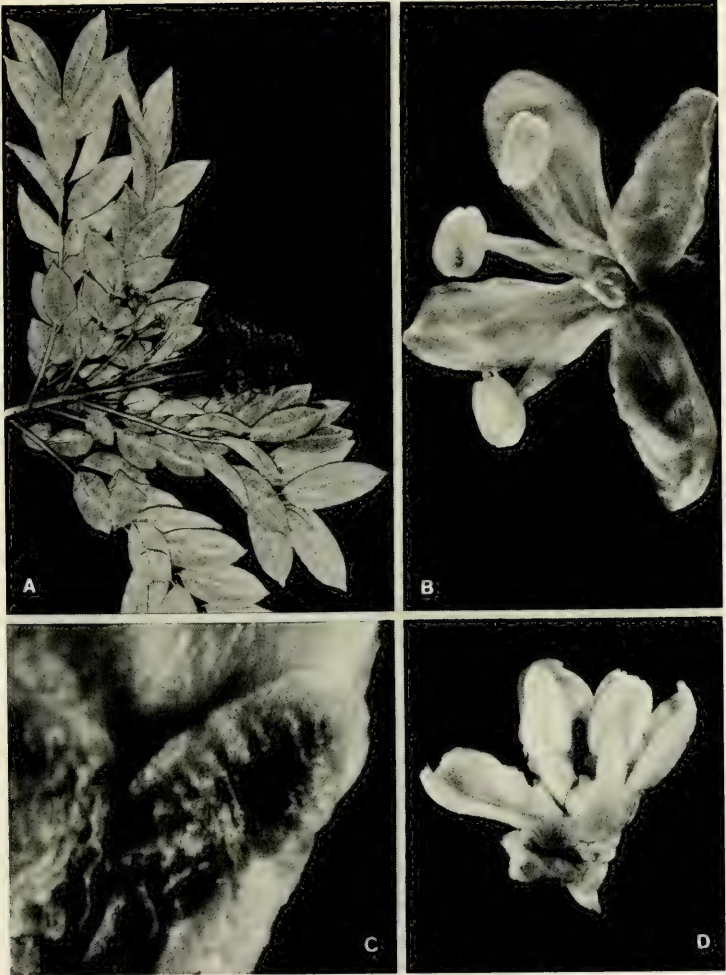
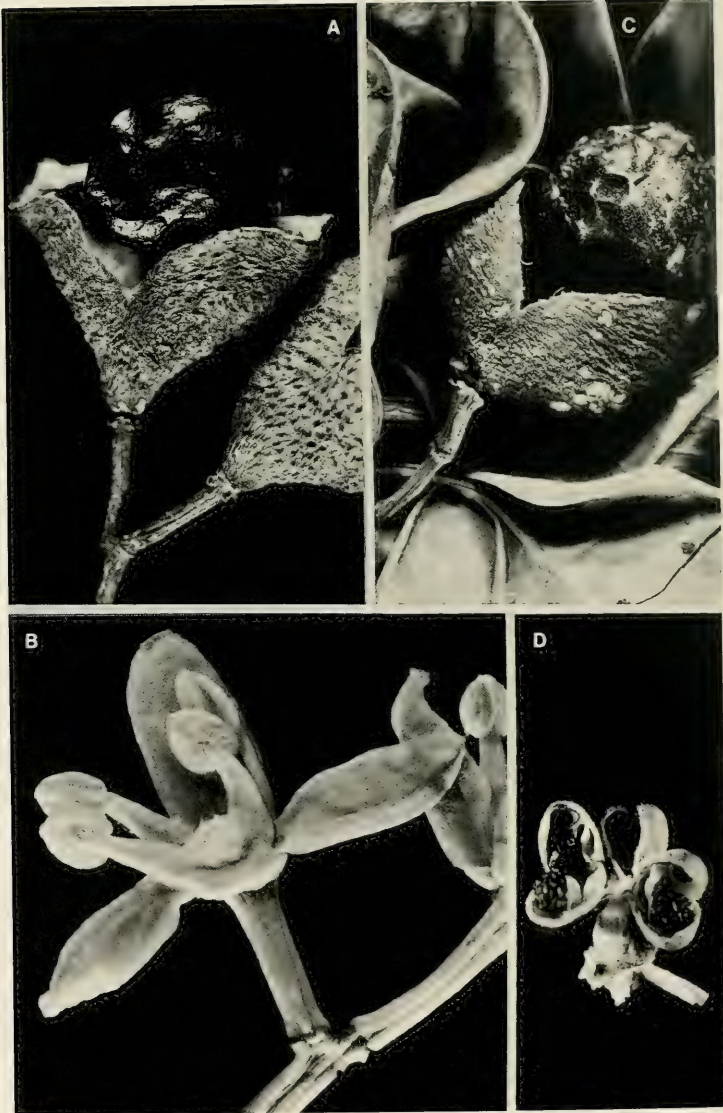


FIGURE 113. A-C, *Zanthoxylum vitiense*; A, distal portion of branchlet, with foliage and inflorescences, $\times 1/3$; B, σ flower, with 1 stamen removed, $\times 8$; C, calyx lobe, with large gland in center, $\times 40$. D, *Zanthoxylum myrianthum*; σ flower, with 1 petal and 1 stamen removed, $\times 8$. A-C from Smith 1884, D from Smith 6769.



Zanthoxylum vitiense and *Z. myrianthum* are not closely related to the *Z. pinnatum* complex, being at once separated by their sessile flowers and strongly crenulate leaflet blades. These two Fijian endemics appear most closely allied to the Malesian species with 1-carpellate gynoecia, such as the New Guinean *Z. conspersipunctatum* Merr. & Perry and the Papuan-Solomon Islands *Z. pluviatile* T. Hartley, from which they differ in dimensional details and by the presence of a large, immersed gland in the center of each calyx lobe (FIGURE 113C).

4. *Zanthoxylum myrianthum* (A. C. Sm.) Waterman in Taxon 24: 364. 1975; A. C. Sm. in Allertonia 1: 409. 1978. FIGURE 113D.

Fagaria myriantha A. C. Sm. in J. Arnold Arb. 32: 229. 1951; J. W. Parham, Pl. Fiji Isl. 166. 1964, ed. 2. 234. 1972.

A tree to 15 m. high, with a trunk about 15 cm. in diameter, found in dense forest at an elevation of 100–250 m. The petals and filaments are white, the anthers yellow. The species is known only from the type collection, obtained in flower in December.

TYPIFICATION: The type is *Smith 6769* (A HOLOTYPE; ISOTYPES at BISH, K, US), collected Dec. 1, 1947, at the southern base of the Mathuata Range, Mathuata Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and known only from the type collection.

2. *EUODIA* J. R. & G. Forst. Char. Gen. Pl. 7. 1775, ed. 2. 13. 1776; Backer & Bakh. f. Fl. Java 2: 97, p. p. 1965; St. John in Naturaliste Canad. 98: 572. 1971; T. Hartley in Gard. Bull. Singapore 34: 92. 1981.

Euodia Lam. Encycl. Méth. Bot. 2: 403, orth. var. 1788; Seem. Fl. Vit. 30, p. p. 1865; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 225, p. p. 1931; A. C. Sm. in J. Arnold Arb. 32: 230, p. p. 1951.

Trees or shrubs, unarmed, the indument of simple hairs; leaves opposite, 3- and, or 1-foliolate, the leaflet blades pellucid-glandular, entire; inflorescences axillary, paniculate; flowers ♂, 4-merous; calyx composed of separate sepals or basally connate lobes, pilose without, persistent in fruit; petals imbricate in bud, persistent in fruit; stamens 4, distinct, the filaments sublinear, glabrous, persistent in fruit, the anthers broadly ovoid, apiculate; disk patelliform, undulate; gynoecium a 4-carpellate, 4-locular, subapocarpous pistil, the placentation axile, the ovules 2 per locule, the style composed of 4 contiguous styler elements, the stigma inconspicuous; fruits composed of 1–4 basally connate follicles, the epicarp dry and hard at maturity, the endocarp cartilaginous, discharged with the seeds, these 2 (or 1 by abortion) per follicle, the testa thin, brittle, brownish black, dull to slightly lustrous, minutely roughened.

TYPE SPECIES: *Euodia hortensis* J. R. & G. Forst., the only original species. Although the original spelling of the Forsters' generic name was *Euodia*, many (or perhaps most) subsequent authors have used the variant spelling *Evodia*. In the present treatment of this genus and the next (*Melicope*) I have used the correct spelling *Euodia* regardless of that used by different writers, in order to avoid complexity in literature citations.

DISTRIBUTION: New Guinea and northeastern Australia eastward, with about six species. It seems likely that *Euodia hortensis*, the only species of the genus that occurs in Fiji and eastward, was an aboriginal introduction there, in which case the indigenous limit of *Euodia* in Melanesia would remain to be established.

FIGURE 114. A & B. *Zanthoxylum pinnatum*: A, dehiscent fruit, composed of a single 1-seeded follicle, × 4; B, ♂ flower, with 1 petal removed, × 8. C, *Zanthoxylum gillespieanum*; dehiscent fruit, composed of a single 1-seeded follicle, × 4. D, *Melicope vitiensis* var. *vitiensis*; fruit, with 4 essentially free lobes, 3 of them dehiscent to show 2 seeds each, × 4. A from *MacDaniels 1093* (Vava'u, Tonga), B from *Smith 1150*, C from *Gillespie 3943*, D from *DA L.22297*.

In an important recent paper, T. G. Hartley (A revision of the genus *Tetradium* (Rutaceae). Gard. Bull. Singapore 34: 91-131. 1981) has reinstated the Indo-Malesian *Tetradium* Lour. as a genus distinct from *Euodia*, at the same time redefining *Euodia* and *Melicope*, genera which have been unsatisfactorily delineated by earlier students. As a result of his conclusions, many species traditionally placed in *Euodia* require new binomials in *Melicope*. Dr. Hartley is now engaged in revisional work on these two genera, and he has very kindly provided me with new characterizations of both genera and with much advance information regarding the species of the Fijian Region. At his suggestion I am in the present *Flora* making the requisite transfers to *Melicope* of certain Fijian taxa that have previously been thought to represent *Euodia*. Further evaluation of these taxa, and also the proper disposition of others occurring in Samoa, Tonga, and Niue (cf. Smith, 1951), must await Hartley's revision, but I here express my gratitude to him for pointing out a satisfactory solution of *Euodia*-*Melicope* relationships.

1. *Euodia hortensis* J. R. & G. Forst. Char. Gen. Pl. 7. pl. 7. 1775, ed. 2. 14. pl. 7. 1776; A. C. Sm. in J. Arnold Arb. 32: 233. 1951; Yuncker in Bishop Mus. Bull. 220: 152. 1959; St. John & A. C. Sm. in Pacific Sci. 25: 331. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 139. 1972.

The two forms into which *Euodia hortensis* may be divided have essentially the same known distributions, and in Fiji the same local names are used for both and the same local uses are recorded. Floral characters seem remarkably uniform throughout the species, but the leaves of the two forms are usually strikingly different, only infrequently posing problems as to the reasonable assignment of individual plants. In Fiji the species is noted as a shrub or tree 1-6 m. high, occurring from near sea level to approximately 600 m., cultivated in towns and villages and now also naturalized in various types of forest and in thickets. The foliage and inflorescences have a strong, pungent fragrance; the calyx is pale green to white, the petals are white or yellowish, the disk is yellow, and the stamens (both filaments and anthers) are white; the fruit turns from green to pale brown at maturity. Flowers and fruits are to be found throughout the year.

DISTRIBUTION: *Euodia hortensis* is widespread in the Pacific, but in Fiji, Samoa, and Tonga it is seen only in cultivation or in more or less disturbed areas, almost certainly having been an aboriginal introduction. It also occurs as an ornamental farther west, as in Java (Backer & Bakh. f. Fl. Java 2: 98. 1965). Presumably it is indigenous in New Guinea or western Melanesia.

LOCAL NAMES AND USES: The usual Fijian names are *uthi*, *uthe*, or *rauvula*; infrequently recorded are *salusalu*, *sathasatha*, *lauthi*, and *mata ni rangginggi*. The inflorescences are commonly used in necklaces and also to scent coconut oil, and the leaves are sometimes used for scouring. Reports of medicinal uses are numerous, the leaves being chewed as a remedy for toothache or stomach pains, used to prepare a tea said to reduce fever, or crushed to prepare a remedial bath. Other reputed uses indicate the bark to be sometimes part of an internal remedy to relieve thrushlike conditions, to retard menstruation, and to relieve pain in childbirth.

KEY TO FORMS

- Leaves 1- or 3-foliolate, the leaflet blades usually 4-5 times as long as broad, 7-24 × (2-) 2.5-6 cm., with 6-10 (-14) curved-ascending lateral nerves. 1a. f. *hortensis*
 Leaves 1-foliolate, the leaflet blades usually 9-15 times as long as broad, 10-30 × 0.8-2.5 cm., with 15-30 or more short, spreading lateral nerves. 1b. f. *simplicifolia*

- 1a. *Euodia hortensis* f. *hortensis*; A. C. Sm. in J. Arnold Arb. **32**: 233. 1951; Yuncker in Bishop Mus. Bull. **220**: 152. 1959; J. W. Parham, Pl. Fiji Isl. 165. 1964, ed. 2. 234. 1972; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 139. 1972.

Euodia hortensis sensu J. R. & G. Forst. Char. Gen. Pl. 7, pl. 7. 1775, ed. 2. 14, pl. 7. 1776; DC. Prodr. **1**: 724. 1824; A. Gray, Bot. U. S. Expl. Exped. **1**: 332. 1854; Seem. in Bonplandia **9**: 255. 1861, Viti, 434. 1862, Fl. Vit. 30. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 132. 1890; Christophersen in Bishop Mus. Bull. **128**: 106. 1935.

Fagara euodia L. f. Suppl. Pl. 125. 1781; Murray, Syst. Veg. ed. 14. 160, as *F. evodia*. 1784; Forst. f. Fl. Ins. Austr. Prodr. 10, as *F. evodia*. 1786.

Zanthoxylum varians Benth. in London J. Bot. **2**: 214. 1843.

Euodia hortensis var. *typica* Lauterb. in Bot. Jahrb. **55**: 231, nom. inadmis. 1918; Guillaumin in J. Arnold Arb. **12**: 233. 1931.

TIPIFICATION: The type of the species is *J. R. & G. Forster* (BM HOLOTYPE; ISOTYPE at K, p. p.), collected during Cook's second voyage on Tanna, New Hebrides. No locality was given in the original publication, and I cannot explain why the type locality has usually been indicated as Tonga (e. g. Smith, 1951; St. John, 1971). The BM sheet is clearly indicated as from Tanna, although the Forsters obtained the species in both archipelagoes (G. Forster, 1786: "Insulae Amicorum et nouae Hebrides"). The BM specimen represents the typical form, while the K specimen includes both forms. *Zanthoxylum varians* is typified by *Hinds & Barclay* (K HOLOTYPE, 4 sheets; ISOTYPE at BM as *Barclay 3425*), collected between May 28 and June 16, 1840, on Nukulau Island, Rewa Province, Viti Levu.

DISTRIBUTION: As of the species as a whole; some 45 collections from nine Fijian islands are at hand, but the typical form, the more frequent one, may be expected on most inhabited islands.

REPRESENTATIVE COLLECTIONS: VITI LEVU: Mba: Nalotawa, eastern base of Mt. Evans Range, *Smith 4329*. NADRONGA & NAVOSA: Near Singatoka River, *Greenwood 832*. SERUA: Namboutini, *DF 418 (Damani 90)*. NAMOSI: Nanggarawai, Wainikoroiluva River, *DA 1400*. NAITASIRE: Waimbasanga, Wainimala River, *St. John 18307*. TAILEVU: Between Mbureta and Ndaku, *DA 866*. REWA: Vatuwangga, Suva, *DA 9224 (McKee 2789)*; Nukulau Island, *H. B. R. Parham 10*. MBENGGGA: Rukua Beach, *DA 6045*. KANDAVU: Namalata isthmus region, *Smith 6*. OVALAU: North of Levuka, *Gillespie 4560*. VANUA LEVU: MATHUATA: Undu Point, *Tothill 52b*. THAKAUNDRIVE: Savusavu Bay region, *Degener & Ordenez 13863*. TAVEUNI: Mbouma, *Weiner 71-7-6A*. MOALA: Naro, *Smith 1404*. MATUKU: *Bryan 256*. VANUA MBALAVU: Nambavatu, *Tothill 52*. FIJI without further locality, *U. S. Expl. Exped., Seemann 91*.

- 1b. *Euodia hortensis* f. *simplicifolia* (Rechinger) K. Schum. ex Lauterb. in Bot. Jahrb. **55**: 232. 1918; Christophersen in Bishop Mus. Bull. **128**: 106. 1935; Yuncker in op. cit. **178**: 67. 1943, in op. cit. **184**: 43. 1945; A. C. Sm. in J. Arnold Arb. **32**: 234. 1951; Yuncker in Bishop Mus. Bull. **220**: 152. 1959; J. W. Parham, Pl. Fiji Isl. 165. 1964, ed. 2. 234. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 183. 1970; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 139. 1972.

Euodia longifolia A. Rich. Sert. Astrolab. 61. 1834, Atlas, pl. 22. 1833; A. Gray, Bot. U. S. Expl. Exped. **1**: 332. 1854; Seem. in Bonplandia **9**: 255. 1861, Viti, 434. 1862, in J. Bot. **2**: 71. 1864.

Euodia hortensis var. *simplicifolia* Rechinger in Denkschr. Akad. Wiss. Wien **85**: 294. 1910.

TIPIFICATION AND NOMENCLATURE: *Euodia longifolia* was based on a collection from New Guinea; *E. hortensis* var. *simplicifolia* on *Rechinger 3735* (HOLOTYPE presumably at w), collected near Vaipouli, Savai'i, Samoa. The latter furnishes the appropriate epithet at a trinomial level.

DISTRIBUTION: Although it seems to occur throughout the range of the species, the form with narrow leaflet blades is less frequent than the typical form in our area.

AVAILABLE COLLECTIONS: VITI LEVU: Without further locality, *D.A.* April 20, 1949. OVALAU: Hills southeast of valley of Mbureta River, *Smith 7429*. NGAU: Hills east of Herald Bay, inland from Sawaieke, on slopes of Mt. Vonda and toward Waikama, *Smith 7977*. TAVEUNI: Somosomo, *Seemann 92*. MOALA: Naroï, *Smith 1403*. FIJI without further locality, *U. S. Expl. Exped., Milne 152, Graeffe*.

3. MELICOPE J. R. & G. Forst. *Char. Gen. Pl.* 28. 1775, ed. 2. 55. 1776; Engl. in Engl. & Prantl, *Nat. Pflanzenfam.* ed. 2. **19a**: 231. 1931; A. C. Sm. in *J. Arnold Arb.* **32**: 248. 1951; T. Hartley in *Gard. Bull. Singapore* **34**: 92. 1981.

Acronychia sensu Engl. in Engl. & Prantl, *Nat. Pflanzenfam.* ed. 2. **19a**: 309, p. p. 1931; A. C. Sm. in *J. Arnold Arb.* **32**: 242, p. p. 1951.

Trees or shrubs, usually functionally dioecious, the indument of simple or predominantly stellate to sublepidote trichomes; leaves opposite, 3- and/or 1-foliolate; inflorescences axillary or borne on branchlets below leaves, cymose to paniculate; flowers functionally unisexual (rarely ♀), 4-merous; calyx composed of separate sepals or partially connate lobes, persistent in fruit; petals usually narrowly imbricate in bud, usually caducous (rarely persistent) in fruit; stamens 4 or 8, distinct, the filaments sublinear, glabrous or rarely ciliolate proximally, caducous or subsistent in fruit, the anthers ovoid to ellipsoid, obtuse at apex (usually reduced and lacking pollen in ♀ flowers); disk patelliform or pulvinate, undulate; gynoecium a 4-carpellate, 4-locular, subapocarpous to syncarpous pistil (rudimentary in functionally ♂ flowers), the placentation axile, the ovules 2 (very rarely 1) per locule, the style composed of 4 contiguous styler elements, the stigma peltate to capitate and somewhat 4-lobed, very rarely inconspicuous; fruits composed of 1-4 basally connate follicles or syncarpous (carpels united into a loculicidally dehiscent capsule), the epicarp dry and hard at maturity, the endocarp cartilaginous, persistent in dehisced fruits (or at least not discharged with the seeds), the seeds 2 (infrequently 1) per locule, remaining attached in or very tardily discharged from dehisced fruits, the testa composed of an inner bony layer and an outer spongy layer, pelliculose, the pellicle smooth, black, shiny, crustaceous.

TYPE SPECIES: *Melicope ternata* J. R. & G. Forst., the only original species.

DISTRIBUTION: Madagascar to southeastern Asia (India and southern China) through Malesia to eastern Australia and New Zealand, and eastward in the Pacific to the Society Islands, probably with about 150 species. Nine species are believed to occur in Fiji, all here considered endemic.

In his revision of the genus *Acronychia* J. R. & G. Forst., Hartley (in *J. Arnold Arb.* **55**: 469-567. 1974) discussed the past confusion between species of that genus and those of *Euodia* and *Melicope*. His clarification indicates that *Acronychia* is composed of 42 species (a few have been added since) and reaches its eastern limits in the Solomon Islands, New Caledonia, and Lord Howe Island. The species of the Fijian Region that I had referred to *Acronychia* (1951, pp. 242-248) should be placed in *Melicope* (Hartley, 1974, pp. 558, 559), with the exception of *A. petiolaris*, now referred to *Sarcomelicope* (q. v.); those species are six in number, of which five are believed endemic in Samoa and one in Tonga and Niue. Hartley (1974, p. 558) suggested that a separation between *Euodia* and *Melicope* resting solely on the number of stamens might prove unpractical; his 1981 treatment of *Tetradium* suggests a more logical distinction between *Euodia* and *Melicope*, and his revision of those genera now in progress will provide appropriate binomials for species of the Fijian Region that are referable to *Melicope*. For five Fijian species of *Melicope* that require new combinations, Hartley has suggested

that I make them in the present work, for which suggestion I am much indebted, whether or not his current studies justify my present interpretation of specific limits.

Our species of *Melicope* have flowers with petals white to pale yellow, sometimes with greenish glands and becoming pink-tinged; the filaments are white or cream-colored and the functional anthers are bright yellow; the fruits are dark green to yellowish brown or purple-tinged, with black, shiny seeds.

KEY TO SPECIES

Ovules 2 per carpel; inflorescences mostly ample and many-flowered; leaves usually 3-foliolate, rarely 1-foliolate.

Stamens 4; indument of simple trichomes; fruiting carpels glabrous or essentially so at maturity.

Flowers apparently always ♂; petals persistent in fruit; indument of disk scarcely apparent; stigma inconspicuous, scarcely differentiated from style; fruiting carpels connate only at base; leaflet blades not exceeding 14 × 3 cm. 1. *M. seemannii*

Flowers apparently always functionally unisexual; petals caducous after anthesis; indument of disk obvious; stigmas in ♀ flowers peltate to capitate; fruiting carpels connate up to about 1/4 their length.

Leaflet blades obovate or elliptic-obovate, sometimes elliptic, not exceeding 13.5 × 7 cm. and usually considerably smaller, the apex rounded or broadly obtuse, retuse. 2. *M. cucullata*

Leaflet blades elliptic or oblong-elliptic, usually 6–20 × 3–11 cm., the apex acuminate or cuspidate (actual apex callose-tipped to rounded or faintly emarginate). 3. *M. vitiensis*

Stamens 8; indument of predominantly stellate or sublepidote trichomes; fruiting carpels connate only at base; flowers apparently always functionally unisexual.

Trichomes of leaflet venation on lower surface simple, obvious, about 1 mm. long, the indument otherwise stellate but the hairs minute; fruiting carpels copiously and persistently hispidulous-puberulent; leaflet blades lanceolate to ovate-lanceolate, 6–12 × 2.5–5.5 cm., gradually acuminate or cuspidate at apex and callose-tipped. 4. *M. evansensis*

Trichomes stellate, including those of leaflet venation on lower surface.

Leaflets comparatively small, the blades 8–17 × 2–8.5 cm., inconspicuously stellate-puberulent on nerves beneath or appearing glabrous, the secondary nerves 6–12 per side; petioles rarely exceeding 10 cm. in length, glabrous or early glabrate; disk minutely puberulent.

Leaflet blades papyraceous, cuspidate to acuminate at apex, not conspicuously decurrent on petiolules, these 2–13 mm. long; pedicels 1.5–3.5 mm. long at anthesis.

Petioles usually 5–10.5 cm. long; leaflet blades elliptic to elliptic-obovate, 9.5–17 × 4.5–8.5 cm., cuspidate to an apex 3–10 mm. long, the secondary nerves 8–12 per side.

5. *M. homoeophylla*

Petioles usually 4–6 cm. long; leaflet blades lanceolate to oblanceolate, usually 8–12.5 × 2–4 cm., gradually acuminate to an apex 10–20 mm. long, the secondary nerves 6–10 per side.

6. *M. taveuniensis*

Leaflet blades subcoriaceous, obovate or obovate-elliptic, 8–12.5 × 3–5.5 cm., rounded and abruptly callose-mucronate at apex (mucro 1–2 mm. long), long-decurrent on petiolules, these 5–20 mm. long and appearing narrowly winged nearly to base; pedicels 1–2 mm. long at anthesis. 7. *M. flaviflora*

Leaflets large, the blades subcoriaceous, obovate or elliptic-obovate, 20–40 × 10–16 cm., copiously stellate-hispidulous-puberulent beneath at least on nerves, the secondary nerves 12–17 per side; petioles robust, 12–23 cm. long, persistently stellate-hispid-puberulent; disk copiously velutinous-puberulent. 8. *M. robusta*

Ovule 1 per carpel, the carpels united only at base; stamens 4; disk glabrous or nearly so; inflorescences 1–8 cm. long and comparatively few-flowered, the flowers apparently always functionally unisexual; fruiting carpels connate only at base; indument of simple trichomes; leaves small, predominantly 1-foliolate, sometimes 3-foliolate, the leaflet blades lanceolate or ovate-lanceolate, 4–11 × 1.3–5.5 cm.

9. *M. capillacea*

1. *Melicope seemannii* (Gillespie) A. C. Sm., comb. nov.

Melicope? Seem. in Bonplandia 9: 255. 1861.

Euodia drupacea sensu A. Gray in Bonplandia 10: 35. 1862, in Proc. Amer. Acad. Arts 5: 316. 1862; Seem.

Viti, 434. 1862, Fl. Vit. 30, p. p. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 131, p. p. 1890; non Labill.

Euodia seemannii Gillespie in Bishop Mus. Bull. 91: 12. fig. 12, as *E. seemanni*. 1932; A. C. Sm. in J. Arnold Arb. 32: 236. 1951; J. W. Parham, Pl. Fiji Isl. 166. 1964, ed. 2. 234. 1972.

Shrub or small tree, found at elevations from near sea level to about 300 m. in forest or on open hillsides.

TYPIIFICATION: The type is *Seemann 90* (GH HOLOTYPE; ISOTYPES at BM, K), collected in 1860 at Port Kinnaird, Ovalau. Gillespie did not mention a locality, none being available on the GH specimen, but the K specimen is clearly labelled "Port Pinair," later changed by Seemann to Port Kinnaird. My citation of "Mathuata" (1951) was incorrect; Seemann's (1865) mention of that locality referred to the *U. S. Expl. Exped.* specimen which I now refer to *Melicope vitiensis* var. *minor*.

DISTRIBUTION: Endemic to Fiji and apparently rare, known from only four collections from three islands.

LOCAL NAMES: Recorded names are *ndrautolu* and *sahasalu rakalava*.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Vicinity of Nanduruloulou, *DA 166, 962*. VANUA LEVU: MBUA: Southern portion of Seatovo Range, *Smith 1707*.

2. *Melicope cucullata* (Gillespie) A. C. Sm., comb. nov.

Euodia cucullata Gillespie in Bishop Mus. Bull. **91**: 10, fig. 11. 1932; A. C. Sm. in J. Arnold Arb. **32**: 236. 1951.

Functionally dioecious trees or shrubs to 14 m. high. Flowers have been obtained between June and January, fruits between December and July.

DISTRIBUTION: Endemic to Fiji and now known from eight of the islands. Two varieties are recognized.

KEY TO VARIETIES

Petioles 1.5–5 cm. long; leaflet blades usually 4–8 × 2–3.7 cm., with 6–9 pairs of secondary nerves; shrub or tree 1–5 m. high occurring at elevations of 550–1,220 m. (but lower in Yasawas).

4a. var. *cucullata*

Petioles (2.5–) 3–7.5 cm. long; leaflet blades usually 6–13.5 × 2.5–7 cm., with 7–12 pairs of secondary nerves; usually a tree 3–13 m. high occurring at elevations from near sea level to 600 m.

4b. var. *robustior*

2a. *Melicope cucullata* var. *cucullata*.

Euodia cucullata Gillespie in Bishop Mus. Bull. **91**: 10, fig. 11. 1932.

Euodia cucullata var. *cucullata*; A. C. Sm. in J. Arnold Arb. **32**: 237. 1951; J. W. Parham, Pl. Fiji Isl. 165. 1964, ed. 2. 233. 1972.

Shrub or slender tree 1–5 m. high, known from elevations of 550–1,220 m. (lower only in Yasawas) in dense forest or on its edges, in hillside thickets, and in the dense vegetation of crests and ridges.

TYPIIFICATION: The type is *Gillespie 3198* (BISH HOLOTYPE, ISOTYPES at GH, K, NY, UC), collected Nov. 14, 1927, on the slopes of Mt. Nanggaranambuluta, east of Nandarivatu, Mba Province, Viti Levu.

LOCAL NAMES AND USE: The names recorded are often generic in connotation: *ndrautolu*, *rautolu*. In the Yasawas the plant is considered medicinal and is used to relieve sore throats.

AVAILABLE COLLECTIONS: YASAWAS: WAYA: Naruarua Gulch, west of Mbatinaremba, *St. John 18034*. VITI LEVU: MBA: "Between Tuatuatholo and Nandi," *H. B. R. Parham 114*; slopes of the escarpment north of Nandarivatu, *Smith 6086*; vicinity of Nandarivatu, *Tothill 51, Gillespie 3743, Degener & Ordenez 13609*, p. p., *DA 2148*; Mt. Nanggaranambuluta, *DA 2146, 13569*. VANUA LEVU: MBUA: Navotuvotu, summit of Mt. Seatava, *Smith 1675*. MATHUATA: Mt. Ndalanathau, *DA 16062, 16067*. THAKAUNDRIVE: Summit of Mt. Mbatini, *Smith 686*. TAVEUNI: Borders of lake east of Somosomo, *Smith 872, DA 12403*; summit of Uluingalau, *Smith 894*.

2b. *Melicope cucullata* var. *robustior* (A. C. Sm.) A. C. Sm., comb. nov.

Zanthoxylon varians sensu Seem. in Bonplandia **9**: 255. 1861. Viti, 435, p. p. 1862; non Benth.

Acronychia heterophylla sensu A. Gray in Bonplandia **10**: 35. 1862, in Proc. Amer. Acad. Arts **5**: 316. 1862; non A. Gray (1854).

Euodia cucullata var. *robustior* A. C. Sm. in J. Arnold Arb. **32**: 238. 1951; J. W. Parham, Pl. Fiji Isl. 165. 1964, ed. 2. 234. 1972.

Often slender tree 3–13 m. high (rarely a gnarled shrub as small as 0.5 m.), occurring from near sea level to 600 m. in open forest or thickets or among reeds, sometimes on limestone.

TYPIFICATION: The type is *Smith 6372* (A HOLOTYPE; ISOTYPES at BISH, K, US), collected Oct. 27, 1947, on the southern slopes of Mt. Numbuloa, east of Lambasa, Mathuata Province, Vanua Levu.

LOCAL NAMES AND USE: Recorded names are *ndrautolu*, *raulolu*, *tokatolu*, and *nggaringarikalavu*; a medicinal tea is said to be made from the fresh or dried leaves.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vicinity of Vakambuli, *DA 11153*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 13399*; Mbulu, near Sovi Bay, *Degener 15047*. SERUA: Hills between Wainngere and Waisee Creeks, between Ngaloa and Wainiyambia, *Smith 9654*. NAITASIRE: Central road, *Toihill F514*; Tholo-i-suva, *DF 531 (Watkins 793)*. MBENGGGA: Ndakuni, *DA 2083*; between Ndakuni and Lalati, *DA 13724*. KORO: East coast, *Smith 1041*. VANUA LEVU: MATHUATA: Southern slopes of Mt. Numbuloa, east of Lambasa, *Smith 6568*. THAKAUNDOVE: Mt. Kasi, Yanawai River region, *Smith 1778*. VANUA MBALAVU: Northern limestone section, *Smith 1505*; Namalata islet, southern limestone section, *Smith 1436*. KAMBARA: On limestone formation, *Smith 1251*. FIJI without further locality, *Seemann 102*, p. p. (BM, K), 103, p. p. (GH).

3. *Melicope vitiensis* (A. C. Sm.) A. C. Sm., comb. nov.

Euodia vitiensis A. C. Sm. in J. Arnold Arb. 32: 238. 1951.

Functionally dioecious trees 2–14 m. high (rarely slender shrubs), occurring at elevations from near sea level to 1,150 m. in dense, dry, or secondary forest and in thickets on dry slopes. Flowers have been noted between July and March, fruits between November and July.

DISTRIBUTION: Endemic to Fiji and now known from seven of the high islands. Sixty collections have been examined, which fall about equally into two varieties, these not appearing to have very different ecological requirements.

LOCAL NAMES AND USES: These do not distinguish between the two varieties and in fact are essentially generic: *ndrautolu*, *ndrautolu ni mbaravi*, *tokatolu*, *kai tambua*, and *nggaringarikalavu*; unspecified medicinal uses are ascribed to the species.

KEY TO VARIETIES

Petioles (2.5–) 4–13 cm. long; leaflet blades usually 8–20 × 4–11 cm., the apex 5–15 mm. long, usually callose-tipped, rarely faintly emarginate; inflorescences 4.5–11 cm. long. 5a. var. *vitiensis*
 Petioles (1.5–) 2–6.5 cm. long; leaflet blades usually 6–12 × 3–6 cm., the apex cuspidate or short-acuminate, usually faintly emarginate; inflorescences 2–6 (–9) cm. long. 5b. var. *minor*

3a. *Melicope vitiensis* var. *vitiensis*.

FIGURES 114D, 115.

Euodia roxburghiana sensu Seem. Fl. Vit. 31, p. p. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 133, p. p. 1890; non Benth.

Euodia vitiensis var. *vitiensis*; A. C. Sm. in J. Arnold Arb. 32: 240. 1951; J. W. Parham, Pl. Fiji Isl. 166. 1964, ed. 2. 234. 1972.

TYPIFICATION: The type is *Smith 6176* (A HOLOTYPE; ISOTYPES at BISH, K, US), collected Sept. 22, 1947, in hills between Nandala and Nukunuku Creeks, along trail from Nandarivatu toward Lewa, Mba Province, Viti Levu.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Naloto Range (Saunavula), *DA 14756*; vicinity of Nandarivatu, *Parks 20791*; southern slopes of Mt. Tomanivi, *Smith 5215*. NANDRONGA & NAVOSA: Nausori Highlands, *DF 1117 (Damanu 215)*. SERUA: Nathengathenga Creek, upper Navua River, *DA L.13350 (Berry 74)*; flat coastal strip in vicinity of Ngaloa, *Smith 9438*. NAMOSE: Hills east of Wainikorouluva River, near Namuamua, *Smith 9051*. NAITASIRE: Waindrandra Creek, *DA 157*; vicinity of Nasinu, *Gillespie 3439*. KANDAVU: Hills above Namalata and Ngaloa Bays, *Smith 104*. NGAU: Hills east of Herald Bay, inland from Sawaieke, *Smith 7816*. VANUA LEVU: MBUA: West of Thongea, Wainunu River, *DA 15782*. THAKAUNDOVE: Ndrawa (River), *DA 14321*. TAVEUNI: Vicinity of Wairiki, *Gillespie 4803*. MOALA: Near Narei, *Smith 1312*. FIJI without further locality, *Seemann 102*, p. p. (K), *DA L.22297 (DF 91)*.



FIGURE 115. *Melicope vitiensis* var. *vitiensis*, from Smith 9438; a branchlet with foliage and inflorescences in the coastal forest of Serua Province, Viti Levu, \times about 2/5.

3b. **Melicope vitiensis** var. **minor** (A. C. Sm.) A. C. Sm., comb. nov.

Euodia drupacea sensu A. Gray, Bot. U. S. Expl. Exped. 1: 332. 1854; Seem. Fl. Vit. 30, p. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 131, p. 1890; non Labill.

Zanthoxylon roxburghianum sensu Seem. in Bonplandia 9: 255. 1861, Viti, 435. 1862; non Cham. & Schlechtendal.

Zanthoxylum roxburghianum sensu Seem. in Bonplandia 10: 296. 1862; non Cham. & Schlechtendal.

Zanthoxylon varians sensu Seem. Viti, 435, p. 1862; non Benth.

Euodia roxburghiana sensu Seem. Fl. Vit. 31, p. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 133, p. 1890; non Benth.

Euodia vitiensis var. *minor* A. C. Sm. in J. Arnold Arb. 32: 240. 1951; J. W. Parham, Pl. Fiji Isl. 166. 1964, ed. 2. 234. 1972.

TYPIFICATION: The type is *Smith 325* (US 1676076 HOLOTYPE; many ISOTYPES), collected Nov. 8, 1933, in hills south of Nakula Valley, Thakaundrove Province, Vanua Levu.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Vicinity of Lautoka, *Greenwood 323*; Natua Levu, Mt. Evans Range, *DA 14050*; between Mba and Tavua, *Greenwood 797*; Mt. Nanggaranambuluta, east of Nandarivatu, *DA 14031*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 15354*. NAITASIRI: Northern portion of Rairaimatuku Plateau, between Mt. Tomanivi and Nasonggo, *Smith 6089*. YANUTHA (presumably one of the Yanutha Islands south of Ovalau): *Storck 879*. VANUA LEVU: MBUA: Southern portion of Seatovo Range, *Smith 1527*. MATHUATA: U. S. Expl. Exped. (GH, US 15051); Undu Point, *Tothill 53a*. THAKAUNDRIVE: Maravu, near Salt Lake, *Degener & Ordenez 14194*. TAVEUNI: *Seemann 103* (BM, GH, p. p., K); vicinity of Waivevo, *Gillespie 4638*.

4. **Melicope evansensis** (A. C. Sm.) A. C. Sm., comb. nov.

Euodia evansensis A. C. Sm. in J. Arnold Arb. 32: 241. 1951; J. W. Parham, Pl. Fiji Isl. 165. 1964, ed. 2. 234. 1972.

Tree 4–10 m. high, occurring in a restricted area in dense, low forest and in the ridge forest and thickets of crests, at elevations of 950–1,195 m.

TYPIFICATION: The type is *Smith 4241* (A HOLOTYPE; ISOTYPES at BISH, K, US), collected May 2, 1947, on the eastern slopes of Mt. Koroyanitu, Mt. Evans Range, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and as far as known to the isolated Mt. Evans Range of northwestern Viti Levu.

LOCAL NAME: *Ndrautolu*.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Summit of Mt. Koroyanitu, high point of Mt. Evans Range, *Smith 4205*; Mt. Mbotilamu, near summit of Mt. Evans Range, *Greenwood 323*; Mt. Evans Range, *Greenwood 387*.

My original description of *Euodia evansensis* as having four stamens was in error; an available flowering specimen, *Greenwood 387*, is definitely 8-staminate, and there are occasional antepetalous as well as antesepalous stamens persisting in the fruiting collections originally cited (Hartley, in litt.). This apparently very local species is readily distinguished from the four following species in having long, simple trichomes on the lower surfaces of leaflet venation, although otherwise the indument is stellate.

5. **Melicope homoeophylla** A. C. Sm. in J. Arnold Arb. 32: 250. 1951; J. W. Parham, Pl. Fiji Isl. 166. 1964, ed. 2. 235. 1972.

Acronychia heterophylla sensu A. C. Sm. in Bishop Mus. Bull. 141: 75. 1936; non A. Gray.

A tree 5–10 m. high, infrequent in dense forest at elevations of 300–1,155 m. Flowers were obtained in September and November.

TYPIFICATION: The type is *Smith 539* (US 1676627 HOLOTYPE; many ISOTYPES), collected Nov. 21, 1933, on the crest of the Korotini Range between Navitho Pass and Mt. Ndelaikoro, boundary between Mathuata and Thakaundrove Provinces, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and thus far known very sparingly from the two largest islands.

LOCAL NAMES: *Ndrautolu*, *nggarikalavu*.

AVAILABLE COLLECTIONS: VITI LEVU: NAMOSI (at Naitasiri boundary): Summit of Mt. Naitarandamu, *Gillespie 3130*. VANUA LEVU: THAKAUNDROVE: Southwestern slope of Mt. Mbatini, *Smith 632*.

6. **Melicope taveuniensis** A. C. Sm. in J. Arnold Arb. 32: 251. 1951; J. W. Parham, Pl. Fiji Isl. 167. 1964, ed. 2. 235. 1972.

Shrub or slender tree 4–10 m. high, occurring in dense forest at elevations of 500–900 m.

TYPIFICATION: The type is *Smith 754* (NY HOLOTYPE; many ISOTYPES), collected Dec. 14, 1933, on the western slope of Taveuni between Somosomo and Wairiki.

DISTRIBUTION: Endemic to Fiji and thus far known only from Viti Levu and Taveuni.

LOCAL NAMES: Names recorded on Viti Levu are *ndrautolu* and *tokatolu*.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Slopes of Mt. Nairoso, eastern flank of Mt. Evans Range, *Smith 4022*; vicinity of Nandarivatu, *Gillespie 3713*, *DA 14453*; western slopes of Mt. Nanggaranambuluta, east of Nandarivatu, *Greenwood 869*, *Smith 4769*. TAVEUNI: Valley between Mt. Manuka and main ridge of island, east of Wairiki, *Smith 8281*; above Ngathavulo Estate, *DA 16911*.

7. **Melicope flaviflora** A. C. Sm. in J. Arnold Arb. 32: 252. 1951; J. W. Parham, Pl. Fiji Isl. 166. 1964, ed. 2. 235. 1972.

A slender, simple-stemmed shrub 2–3 m. high, infrequent in dense forest at an elevation of 1,050–1,120 m. Flowers have been obtained only in June and July.

TYPIFICATION: The type is *Smith 4998* (A HOLOTYPE; ISOTYPES at BISH, K, US), collected June 30, 1947, on the ridge between Mt. Nanggaranambuluta and Mt. Namama, east of Nandarivatu, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and known only from essentially the type locality on Viti Levu.

LOCAL NAME: *Kai tambua*.

AVAILABLE COLLECTION: VITI LEVU: MBA: Mt. Nanggaranambuluta, east of Nandarivatu, *DA 15253* (coll. R. M. Schuster).

8. **Melicope robusta** A. C. Sm. in J. Arnold Arb. 32: 253. 1951; J. W. Parham, Pl. Fiji Isl. 167. 1964, ed. 2. 235. 1972.

A slender tree or shrub 3–4 m. high, occurring from low elevation (perhaps about 200 m.) to 800 m. in dense forest or in dense crest thickets. Flowers have been obtained in June and August, fruits in September.

TYPIFICATION: The type is *Smith 5863* (A HOLOTYPE; ISOTYPES at BISH, K, US), collected Sept. 2, 1947, in hills between Nggaliwana and Tumbeindreketi Creeks, east of the sawmill at Navai, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and now known from Viti Levu and Ovalau.

LOCAL NAME: *Sauwangga*.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Central road, *Tothill 214*; vicinity of Tamavua, *Gillespie 2417*. REWA: Track from Waimbue Creek to Waimanu River, *DA 15571*; upper Veisari River, on trail to Nambukaluka (on Waindina River), *Horne 975*. OVALAU: Summit of Mt. Tana Lailai and adjacent ridge, *Smith 7697*.

9. **Melicope capillacea** (Gillespie) A. C. Sm., comb. nov.

Euodia capillacea Gillespie in Bishop Mus. Bull. 91: 10. fig. 10. 1932; A. C. Sm. in J. Arnold Arb. 32: 235. 1951; J. W. Parham, Pl. Fiji Isl. 165. 1964, ed. 2. 233. 1972.

Functionally dioecious shrub or slender tree 3–5 m. high, infrequent in forest or dense crest thickets at elevations of 950–1,220 m. (rarely as low as 150 m.). Flowers have been obtained in months scattered between April and January, fruits between June and November.

TIPIFICATION: The type is *Gillespie 4046* (BISH HOLOTYPE; ISOTYPE at GH), collected in flower and fruit Nov. 25, 1927, in the vicinity of Nandarivatu, two miles along the Mba road, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from Viti Levu and Taveuni.

LOCAL NAMES: Names recorded in Mba Province are *velivelitambua* and *mbambandriu*.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Ridge between Mt. Nanggaranambuluta and Mt. Namama, east of Nandarivatu, *Smith 4979, 4992*. SERUA: Vatutavathe, vicinity of Ngaloa, *Degener 15195*. NAMOSI: Summit of Mt. Vakarongasiu, *Gillespie 3259*. TAVEUNI: Summit of Mt. Uluungalau, *Smith 892*.

Melicope capillacea differs from its congeners in the Fijian Region (and perhaps from all known species of *Melicope* –Hartley, in litt.) in having a single, ascending ovule in each ovary locule.

4. SARCOMELICOPE Engl. in Engl. & Prantl, Nat. Pflanzenfam. III. 4: 122. 1896, in op. cit. ed. 2. 19a: 233. 1931; T. Hartley in Austral. J. Bot. 30: 363. 1982; Balg. & Franken in Pacific Pl. Areas 4: 236. map 306. 1984.

Acronychia sensu Seem. Fl. Vit. 31. 1865; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 309, p. p. 1931; A. C. Sm. in J. Arnold Arb. 32: 242, p. p. 1951; P. S. Green in op. cit. 51: 208. 1970; non J. R. & G. Forst.

Bauerella Borzi in Boll. Reale Orto Bot. Giardino Colon. Palermo 1: 155. 1897; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 310. 1931; T. Hartley in J. Arnold Arb. 56: 167. 1975; A. C. Sm. in Allertonia 1: 409. 1978.

Functionally dioecious shrubs or trees, the indument of minute, simple hairs; leaves opposite, rarely ternate, petiolate, unifoliolate, the petiole conspicuously swollen at apex, the leaflet blade sessile on the petiolar swelling, articulated with petiole or not, usually pellucid-glandular; inflorescences axillary, narrowly paniculate; flowers functionally unisexual, 4-merous; sepals free or connate at base, valvate or basally imbricate, persistent; petals narrowly imbricate in bud, persistent; stamens 8, shorter than petals, the filaments flat, ciliate, the anthers dorsifixed (lacking pollen in ♀ flowers); disk intrastaminal, pulvinate; gynoecium a 4-carpellate, subapocarpous to syncarpous (as in our species) pistil (in ♂ flowers reduced in size, lacking differentiated stigma and functional ovules), the ovules 2 per locule, subcollateral or superposed, the style short, the stigma peltate, 4-lobed; fruit a 4-locular drupe, with carpels basally connate but divergent or (as in our species) connate throughout their length, the exocarp fleshy but drying subcoriaceous, the mesocarp hard and woody when dried, the endocarp cartilaginous, the seeds 1 or 2 per locule (if 1 obovoid and adaxially angled, if 2 misshapen and obliquely superposed), carunculate, the testa roughened, with a thin, crustaceous outer layer and a thick, bony inner layer.

TYPE SPECIES: *Sarcomelicope sarcococca* (Baill.) Engl. (*Euodia sarcococca* Baill.). The type species of *Bauerella* is *B. australiana* Borzi, nom. illeg. (*Acronychia baueri* Schott, *Bauerella baueri* Däniker) = *Sarcomelicope simplicifolia* (Endl.) T. Hartley (*Vepri simplicifolia* Endl.).

DISTRIBUTION: Eastern Australia to New Caledonia, the New Hebrides, and Fiji, with seven or eight species; an endemic species terminates the range of the genus in Fiji.

USEFUL TREATMENTS OF GENUS: HARTLEY, T. G. The taxonomic status of the genus *Bauerella* (Rutaceae). J. Arnold Arb. 56: 164–170. 1975. HARTLEY, T. G. A revision of the genus *Sarcomelicope* (Rutaceae). Austral. J. Bot. 30: 359–372. 1982.

The recent discussion of *Sarcomelicope* by Hartley clarifies the generic position of the Fijian plant long known as *Acronychia petiolaris* A. Gray, then placed as a subspecies of *A. simplicifolia* by P. S. Green (1970) and transferred to *Bauerella* as a subspecies by Hartley (1975). Hartley (1982) has expanded Engler's concept of *Sarcomelicope* to include six species, five endemic to New Caledonia and the sixth distributed from Australia to Fiji with three subspecies. The allopatric subspecies of *S. simplicifolia* appear to me better distinguished as species, a suggestion that in no way impugns the excellent summary by Hartley but merely indicates a different concept of infrageneric categories in long-separated oceanic populations.

1. *Sarcomelicope petiolaris* (A. Gray) A. C. Sm., comb. nov. FIGURE 116.

Acronychia petiolaris A. Gray, Bot. U. S. Expl. Exped. 1: 335. 1854, Atlas, pl. 33, A. 1856; C. Muell. in Walp. Ann. Bot. Syst. 4: 416. 1857; Seem. Viti, 434. 1862, Fl. Vit. 31. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 134. 1890; Gibbs in J. Linn. Soc. Bot. 39: 142. 1909; A. C. Sm. in J. Arnold Arb. 32: 243. 1951; J. W. Parham, Pl. Fiji Isl. 164. 1964, ed. 2. 232. 1972.

Jambolifera petiolaris Kuntze, Rev. Gen. Pl. 1: 102. 1891.

Acronychia simplicifolia subsp. *petiolaris* P. S. Green in J. Arnold Arb. 51: 212. fig. 1, c. 1970.

Bauerella simplicifolia subsp. *petiolaris* T. Hartley in J. Arnold Arb. 56: 169. 1975.

Bauerella petiolaris A. C. Sm. in Allertonia 1: 410. 1978.

Sarcomelicope simplicifolia subsp. *petiolaris* T. Hartley in Austral. J. Bot. 30: 371. 1982.

A shrub or slender tree 2–14 m. high, occurring at elevations of 40–1,100 m. in dense, dry, or secondary forest or in thickets. The flowers have petals and filaments white to greenish or pale yellow and yellow anthers; the fruits turn from yellowish green to brown at maturity. Flowers and fruits have been noted in most months.

TYPE: The type is U. S. Expl. Exped. (US 15292 HOLOTYPE; ISCTYPE at GH), collected in 1840 along the Mathuata coast, Mathuata Province, Vanua Levu.

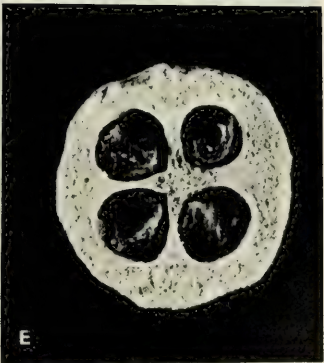
DISTRIBUTION: Endemic to Fiji and thus far known from Viti Levu, Kandavu, and Vanua Levu, approximately 40 collections being available.

LOCAL NAMES AND USE: Although no widely known Fijian name seems attached to this locally frequent species, recorded names are *mariko*, *kaisinga*, and *marasi* (Mba), *ndroundomu* (Kandavu), *ndongotuva* (Mbua), and *nggaringarikalavu* (Mathuata). The timbers are sometimes used in Mba Province for house-building.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Hills between Nandala and Nukunuku Creeks, along trail from Nandarivatu toward Lewa, *Smith 6150*; vicinity of Nandarivatu, *Gibbs 587*; Navai, *DA 14980*. NANDRONGA & NAVOSA: Vicinity of Nandrau, *Berry 64*. TAILEVU: Waimaro River, *DA 1672*. KANDAVU: Without further locality, *DA 12442 (DF 87, Watkins 750)*. VANUA LEVU: MBUA: Koromba Forest, *DA 15118*; southern portion of Seatovo Range, *Smith 1702*. MATHUATA: Divide between headwaters of Ndreketi and Wainunu Rivers, *Smith 1841*; Ndreketi River, *DA 13451*; Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, *Smith 6711*; vicinity of Lambasa, *Greenwood 566*. THAKAUNDOVE: Nakoroutari, south of Lambasa, *DA 15226*; Korotasere, Natewa Bay, *DA 15496*.

Sarcomelicope petiolaris is readily distinguished from the typical phase of *S. simplicifolia* (Endl.) T. Hartley (eastern Australia and Norfolk and Lord Howe Islands). The Fijian taxon has its fruits copiously velutinous with long-persistent, pale brown hairs 0.1–0.2 mm. long (only the oldest fruits being very tardily glabrate); the fruits are indistinctly indented below the apex and at full maturity may become subacute to rounded at apex, lacking subapical indentations; and the leaflet blades are subacuminate or cuspidate to subacute at apex (if inconspicuously emarginate, then with an obvious projected-callose termination of the costa). *Sarcomelicope simplicifolia*

FIGURE 116. *Sarcomelicope petiolaris*: A, distal portion of branchlets, with foliage and fruits, $\times 1/3$; B, functionally σ flower, with 1 sepal, 1 petal, and 3 stamens removed, $\times 8$; C, fruit, $\times 4$; D, longitudinal section of fruit, $\times 4$; E, cross section of fruit, $\times 4$. A from *Smith 1702*, B from *DA 15118*, C & D from *Smith 6711*, E from *Smith 6150*.



lia subsp. *simplicifolia* has its fruits early glabrate or essentially so and subacute at apex, with four obvious subapical indentations; and the leaflet blades are usually obtuse to rounded or retuse at apex. Other points of difference between these taxa were noted by me in 1951 (p. 244, although both taxa were there referred to *Acronychia*) in reference to calyx lobes, disk, and thickness of mesocarp.

Sarcomelicope simplicifolia subsp. *neo-scotica* (P. S. Green) T. Hartley (which I believe to merit specific rather than subspecific status), of New Caledonia and the New Hebrides, resembles subsp. *simplicifolia* in its leaflet blade apices but *S. petiolaris* in its fruit indument. Its fruits are conspicuously longer than those of either of the allied taxa (ratio of breadth to length 1 : 1.35–1.9 rather than approximately 1 : 1), the fruit apex being long-prismatic-conical rather than merely obtuse to acutely 4-angled, with subapical indentations less obvious than those of subsp. *simplicifolia*.

5. *MICROMELUM* Bl. Bijdr. Fl. Ned. Ind. 137. 1825; Seem. Fl. Vit. 31. 1865; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 318. 1931; Swingle in Webber & Batchelor, Citrus Industry 1: 139. 1943. Nom. cons.

Small trees or shrubs, unarmed; leaves alternate, imparipinnate (rarely 3- or 1-foliolate), the rachis unwinged, the leaflets alternate, the blades thin, pellucid-glandular, oblique at base; inflorescences terminal, corymbose-paniculate, often flat-topped, many-flowered; flowers ♂, 5-merous; calyx cupuliform, shallowly lobed; petals valvate in bud, oblong to linear; disk pulvinate; stamens 10, the filaments linear-subulate, glabrous, the anthers ovoid, dorsifixed near base; ovary (2-)3-5(-6)-locular, pilose, the radial walls curved or twisted, the ovules 2 per locule, superposed, the style slender, constricted at base and articulate with ovary, deciduous, the stigma subcapitate; fruits baccate, dry, subglobose or ovoid, the pericarp glandular-punctate, the seeds 1 or 2, with thin, folded, copiously glandular-punctate cotyledons.

TYPE SPECIES: *Micromelum pubescens* Bl.

DISTRIBUTION: Southeastern Asia through Malesia to Australia and eastward to Tonga, Niue, and Samoa, with nine or ten species. The widespread easternmost species is indigenous in Fiji.

1. *Micromelum minutum* (Forst. f.) Seem. Viti, 434. 1862, Fl. Vit. 31. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 134. 1890; Christophersen in Bishop Mus. Bull. 128: 110. 1935; Swingle in Webber & Batchelor, Citrus Industry 1: 149. fig. 25, B, 216. 1943; Yuncker in Bishop Mus. Bull. 178: 70. 1943, in op. cit. 184: 43. 1945; A. C. Sm. in J. Arnold Arb. 32: 226. 1951; Yuncker in Bishop Mus. Bull. 220: 153. 1959; J. W. Parham, Pl. Fiji Isl. 167. 1964, ed. 2. 235. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 184. 1970; St. John & A. C. Sm. in Pacific Sci. 25: 331. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 114, 117, 120. 1972. FIGURE 117.

Limonia minuta Forst. f. Fl. Ins. Austr. Prodr. 33. 1786.

Micromelum glabrescens Benth. in London J. Bot. 2: 212. 1843; A. Gray, Bot. U. S. Expl. Exped. 1: 235. 1854; Seem. in Bonplandia 9: 254. 1861.

Micromelum pubescens var. *glabrescens* Oliver in J. Linn. Soc. 5: Suppl. 2: 40. 1861.

Micromelum pubescens sensu Guillaumin in J. Arnold Arb. 12: 235. 1931; non Bl.

As seen in Fiji, *Micromelum minutum* is a shrub or small tree 1–15 m. high, usually slender, sometimes freely branched, but sometimes compact, occurring at elevations from near sea level to 900 m. and often locally abundant in dense, dry, or open forest, in thickets, and along rocky coasts. The fragrant flowers have the petals and filaments white to pale yellow, the anthers greenish white, and the stigma white; the fruits turn from green to orange and at length to red. Flowers and fruits occur throughout the year.

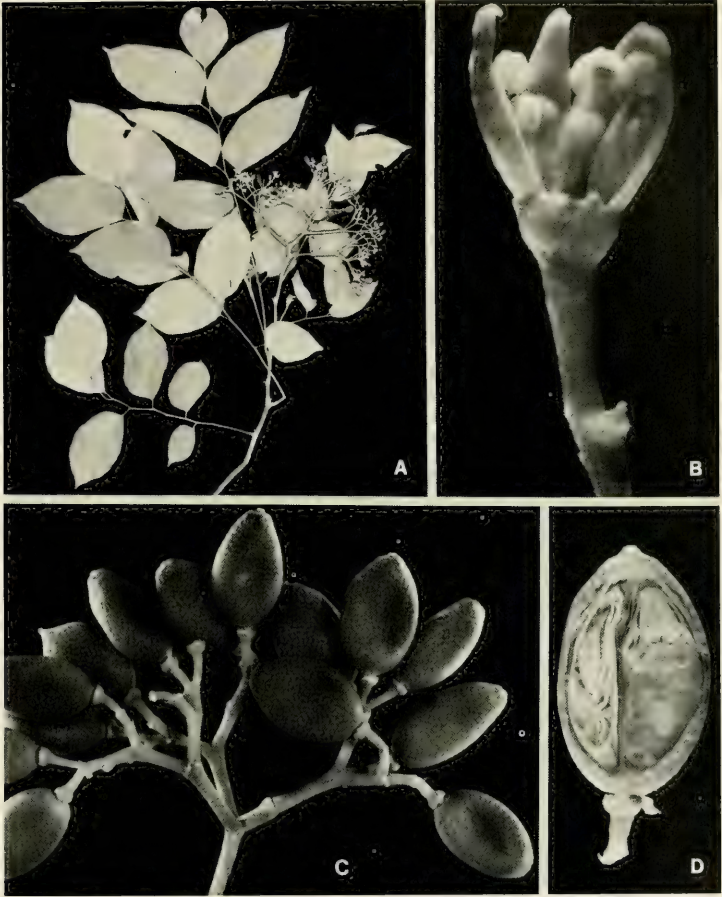


FIGURE 117. *Micromelum minutum*; A, distal portion of branchlet, with foliage, an inflorescence, and a few developing fruits, $\times 1/4$; B, flower, with 1 petal and 2 stamens removed, $\times 10$; C, portion of infructescence with mature fruits, $\times 2$; D, longitudinal section of fruit, showing folded cotyledons, $\times 4$. A from *Smith 1234*. B from *Smith 7035*. C & D from *Smith 213*.

TIPIFICATION AND NOMENCLATURE: The type of *Limonia minuta* is *J. R. & G. Forster* (BM LECTOTYPE; ISOLECTOTYPE at K), collected during Cook's second voyage in Tonga. *Micromelum glabrescens* is typified by *Barclay* (K HOLOTYPE), from Vava'u, Tonga. Bentham compared the latter with *M. pubescens* BL., but he overlooked Forster's earlier epithet.

DISTRIBUTION: Malesia (Philippines, Borneo, and Sumbawa eastward) to north-eastern Australia, Tonga, Niue, and Samoa. Backer and Bakhuizen (Fl. Java 2: 103. 1965) consider that this species also includes *M. pubescens* Bl., usually thought to occur from Burma to Sumatra and Java, but Swingle (1943, p. 143), following Tanaka, gives convincing reasons to keep the two species separate. More than 80 collections have been studied from 17 Fijian islands.

LOCAL NAMES AND USES: This well-known species is commonly known as *ngingila*, *nggilanggila*, *sasanggila*, *sasanggilu*, *sasangilu*, *sawangga*, or *sangingili*. Other and more local recorded names are *mandamanda* (Yasawas), *tawatawa* or *karakarakuro* (Mba), *wawaro*, *wiriwiri*, or *tavolali* (Nandronga & Navosa, the last also from Taveuni), and *nggilanggilakathu* (Mathuata). The timbers are sometimes used for houseposts and parts of the plant (usually the leaves or inner bark of the branches) are reputed to have many medicinal uses, as a liniment, to cure coughs and sore tongues, to arrest profuse menstruation, to treat gonorrhoea, and as a remedy for thrush.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Olo Creek, north of Yalombi, *St. John 18017*. MAMANUTHAS: NGGALITO Island, Malolo Group, *O. & I. Degener 32235*. VITI LEVU: Mba: North of Lomolomo, *Degener & Ordenez 13639*; vicinity of Nandarivatu, *Gillespie 3977*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 13385*; north of Komave, *St. John 18953*. SERUA: Nathengathenga Creek, upper Navua River, *DA L.13349 (Berry 75)*. RA: Vicinity of Rewasa, near Vaileka, *Degener 15395*. NAITASIRI: Tholo-i-suva, *DF 439 (Bola 134)*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7035*; Uthunivanua, *DA 9250 (McKee 2816)*. REWA: Suva, Dept. Agriculture garden, *DA 10248*. KANDAVU: Mt. Mbuke Levu, *Smith 213*. OVALAU: Hills above Levuka, *Gillespie 4408*. NAIRAI: *Milne 183*. NGAU: Shore of Herald Bay, vicinity of Sawaieke, *Smith 7901*. VANUA LEVU: MBUA: Lekutu River, *DA 13495*; southern portion of Seatovo Range, *Smith 1711*. MATHUATA: Seanggangga area, *DA 15377*; Lambasa, *Greenwood 474*. THAKAUDROVE: Savusavu Bay region, *Degener & Ordenez 13948*; Korotasere, *DA 15499*. TAVEUNI: Somosomo, *Seemann 57*. MOALA: Near Naroi, *Smith 1327*. MATUKU: *Bryan 243*. TOTOYA: *Milne 95*. VANUA MBALAVU: Near Lomaloma, *Garnock-Jones 1042*. THIKOMBIA-I-LAU, *Tohill 55*. ONEATA: *Graeffe 1379*. KAMBARA: *Smith 1234*. FULANGA: *Smith 1133*.

6. MURRAYA Koenig ex L. Mant. Pl. Alt. 554, 563, as *Murraea*. 1771; corr. Murray in L. Syst. Veg. ed. 13. 331. 1774; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 319. 1931; Swingle in Webber & Batchelor, Citrus Industry 1: 192. 1943. Nom. et orth. cons.

Bergera Koenig ex L. Mant. Pl. Alt. 555, 563. 1771. Nom. rejic.

Unarmed shrubs or small trees; leaves alternate, imparipinnate, the leaflets alternate or subopposite, the blades often oblique at base; inflorescences axillary or terminal, panicle; flowers ♂, 5-merous, the buds cylindrical or long-ovoid; calyx deeply lobed, the lobes obtuse; petals imbricate, lanceolate to linear; disk annular or pulvinate; stamens 10, the filaments subulate or flattened, the anthers small, elliptic or ovoid, dorsifixed near base; ovary ovoid, 2-5-locular, the ovules 2 per locule, superposed or subcollateral, infrequently solitary, the style long, slender, at length caducous, the stigma capitate; fruits baccate, small, ovoid or ellipsoid, with mucilaginous pulp, the seeds 1 or 2, with a thin testa, the cotyledons plano-convex.

TYPE SPECIES: *Murraya exotica* L. (= *M. paniculata* (L.) Jack).

DISTRIBUTION: Southeastern Asia (Ceylon to southern China and the southern Ryukyus) through Malesia to Queensland, the Mariana Islands, New Hebrides, and New Caledonia, with about eleven species. Two species are widespread in cultivation, as in Fiji, sometimes becoming naturalized.

KEY TO SPECIES

- Leaflets (2-) 4-7 (-8), more or less uniform in size, without a strong odor if bruised, the blades entire or obscurely crenulate; inflorescences compact, 1-8-flowered, the flowers comparatively large, the petals usually 10-15 × 3-6 mm., the filaments 6-12 mm. long, the style 5-9 mm. long; fruits ovoid to ellipsoid, 1-1.3 cm. long, orange to red at maturity. 1. *M. paniculata*
- Leaflets (11-) 13-21, distally accrescent in size, with a strong spicy odor when bruised, the blades crenate to serrate; inflorescences branched, many-flowered, the flowers comparatively small, the petals usually 5-7 × 1.5-2 mm., the filaments 4-6 mm. long, the style 3-4 mm. long; fruits subglobose, about 1 cm. in diameter, black at maturity. 2. *M. koenigi*

1. *Murraya paniculata* (L.) Jack in Malayan Misc. 1 (5): 31. 1820; Swingle in Webber & Batchelor, Citrus Industry 1: 194. fig. 29. 1943; J. W. Parham, Pl. Fiji Isl. ed. 2. 236. 1972.

Chalcas paniculata L. Mant. Pl. 68. 1767.

Murraya exotica L. Mant. Pl. Alt. 563, as *Murraea e.* 1771; Guillaumin in J. Arnold Arb. 12: 236. 1931.

As noted in Fiji, *Murraya paniculata* is a shrub usually kept to 1-2 m. in height by pruning but becoming a small tree to 8 m. high if not pruned, occurring near sea level only in cultivation. The leaflet blades are ovate to subobovate, variable in size (3-10 × 2-4 cm.), thin-coriaceous and nitid; the aromatic flowers have pure white petals; and the small fruits become orange to red at maturity. Dated specimens were flowering in April and October.

TYPIFICATION: *Chalcas paniculata* was presumably based on *Camunium* Rumph. Herb. Amb. 5: 26. t. 17. 1747; *Murraya exotica* on material from India.

DISTRIBUTION: Southeastern Asia and Malesia, but now widespread in cultivation in tropical and subtropical areas.

LOCAL NAME AND USE: The *orange jessamine* is a handsome ornamental, usually utilized in hedges; there are several varieties and cultivars. It may have been first introduced into Fiji by J. B. Thurston, who listed *Murraya exotica* in his 1886 *Catalogue*.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Singatoka, *Greenwood 8*. REWA: Samambula, Suva, *DA 18046*. FIJI without further locality, *DA 578, 1123, 3470*.

2. *Murraya koenigii* (L.) Spreng. Syst. Veg. 2: 315. 1825; Swingle in Webber & Batchelor, Citrus Industry 1: 200. fig. 30. 1943; J. W. Parham, Pl. Fiji Isl. ed. 2. 235. 1972.

Bergera koenigii L. Mant. Pl. Alt. 563. 1771.

As it is seen in Fiji, *Murraya koenigii* is a shrub or small tree 2-5 m. high, cultivated near sea level and also naturalized along roadsides and in open fields and canefields. The leaflet blades are ovate-oblong, 1.5-7 × 1-3 cm., the proximal ones being conspicuously reduced in size; the fragrant flowers have linear petals that are greenish white without and white within; and the fruits turn from pink to black at maturity. Flowers and fruits have been noted between April and November.

TYPIFICATION: The type is presumably a Koenig specimen (LINN) from India.

DISTRIBUTION: Southeastern Asia, now widely cultivated in the tropics.

LOCAL NAMES AND USES: The *curry leaf tree* has been recorded by Hindi names in Fiji: *tej pati*, *karepila*, and *karipilai*. The leaves are used as a flavoring in curries; medicinal uses are ascribed to the leaves, bark, and root. The species was probably brought into Fiji early in the present century.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Saweni Beach, Lautoka, *DA 11754*; Narewa, vicinity of Nandi, *DA 9749*. NAITASIRE: Nanduruloulou (Mbatiki and Cocoa Station), *DA 10934, 12244*. TAILEVU: Nakaile, *DA 5659*. REWA: Department of Agriculture compound, *DA 13268*. VANUA LEVU: THAKAUNDROVE: Namale, near Savusavu, *DA 16891*. FIJI without further locality, *DA 3917*.

7. *TRIPHASIA* Lour. Fl. Cochinch. 152. 1790; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **19a**: 325. 1931; Swingle in Webber & Batchelor, Citrus Industry **1**: 236. 1943.

Shrubs or small trees, with paired, straight, axillary spines; leaves alternate, simple or 3-foliolate (as in our species), the petioles short, wingless, articulated with leaf blade, the blades glandular-punctate; inflorescences axillary 2-4-flowered cymes or flowers solitary, the flowers ♂, 3(-5)-merous, the pedicels slender; calyx cupuliform, lobed about half its length, persistent; petals oblong to obovate; disk pulvinate; stamens (5 or) 6, the filaments slender, sometimes dilated proximally, subulate at apex, the anthers short, subbasifixed, linear; ovary ovoid to elliptic, narrowed toward base, 3(-5)-locular, the ovules 1 (or 2) per locule, the style filiform-clavate, the stigma obtuse; fruits small, ellipsoid to subglobose, the style base persistent, the seeds 1-3, embedded in mucilaginous pulp, sometimes polyembryonic.

TYPE SPECIES: *Triphasia aurantiola* Lour. (= *T. trifolia* (Burm. f.) P. Wilson).

DISTRIBUTION: Southeastern Asia and Malesia, with three species, one of which is widely cultivated elsewhere and sometimes naturalized, as in Fiji.

1. *Triphasia trifolia* (Burm. f.) P. Wilson in Torreya **9**: 33. 1909; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **19a**: 325. fig. 149. 1931; Swingle in Webber & Batchelor, Citrus Industry **1**: 237. fig. 36. 1943; J. W. Parham in Dept. Agr. Fiji Bull. **35**: 98. 1959, Pl. Fiji Isl. 167. 1964, ed. 2. 236. 1972; Purseglove, Trop. Crops, Dicot. 494. 1968.

Limonia trifolia Burm. f. Fl. Ind. 103. t. 35, fl. 1768.

Limonia trifoliata L. Mant. Pl. Alt. 237. 1771.

Triphasia aurantiola Lour. Fl. Cochinch. 153. 1790.

Triphasia trifoliata DC. Prodr. **1**: 536. 1824.

A small, thorny, round-topped shrub, sparingly cultivated near sea level and naturalized in dry waste places on Viti Levu. The trifoliolate leaves have the leaflet blades ovate, crenate, 1.5-5 × 1-2 cm., the lateral ones being much smaller than the terminal one. The fragrant flowers have white petals, and the soft fruits are ovoid to subglobose, up to 1.5 cm. in diameter, and dull reddish brown to crimson at maturity.

TYPIFICATION: Although Burman cited a Rumphius reference, the type (Swingle, 1943) is a Burman specimen (G) from Java. *Limonia trifoliata* was based on the same concept. *Triphasia aurantiola* is typified by a Loureiro specimen at BM.

DISTRIBUTION: Probably indigenous in southeastern Asia or Malesia, but now widely cultivated and often naturalized. It is presumably a fairly recent introduction, the first published record being that of Parham (1959).

LOCAL NAME AND USES: The *limeberry* is an attractive ornamental shrub, often used in hedges. The small fruits are sometimes made into preserves.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Lautoka, DA 11538. REWA: Suva, H. B. R. Parham 307 (BM, coll. Sept. 20, 1932).

8. *WENZELIA* Merr. in Philipp. J. Sci. Bot. **10**: 272. 1915; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **19a**: 326. 1931; Swingle in J. Arnold Arb. **21**: 6. 1940, in Webber & Batchelor, Citrus Industry **1**: 214. 1943; A. C. Sm. in J. Arnold Arb. **36**: 279. 1955.

Shrubs or small trees, unarmed (as in our species) or with axillary, single or paired spines; leaves alternate, simple, large, the petioles short, wingless, canaliculate above, not articulated with leaf blade, the blades oblong to lanceolate, narrowly decurrent on petiole; inflorescences axillary, 1-flowered, the flowers ♂, often large, 3-5-merous (in our species 3- or perhaps 4-merous); calyx cupuliform, shallowly to deeply lobed;

petals oblong or ovate to lanceolate, obtuse to subacute, glandular-punctate; disk annular to shallowly cupuliform or pulvinate; stamens 8–10, free, the anthers long; ovary oblong-ellipsoid, 3–5-locular (3-locular in our species), narrowed proximally, the ovules 4–8 (usually 6) per locule, biseriate, the style tapering, the stigma capitate; fruits subglobose to ellipsoid, the pericarp coriaceous, glandular, the seeds 2–30 (apparently usually 2 in our species but perhaps sometimes 3 or 4), immersed in mucilaginous pulp, in subgen. *Wenzelia* large, ellipsoid to ovoid or slightly flattened, the testa thick, the cotyledons thick, plano-convex.

TYPE SPECIES: *Wenzelia brevipes* Merr.

DISTRIBUTION: Southern Philippines and New Guinea eastward to Fiji, with nine species, its range terminating in Fiji with an endemic species.

Of the two subgenera proposed by Swingle (1940, p. 16), the Fijian endemic falls into subgen. *Wenzelia* ("Euwenzelia" Swingle), with few, large, thick seeds.

1. *Wenzelia kambarae* Swingle in J. Arnold Arb. 21: 12. pl. 3, fig. 6–8. 1940, in Webber & Batchelor, Citrus Industry 1: 218. 1943; A. C. Sm. in J. Arnold Arb. 32: 226. 1951, in op. cit. 36: 279. 1955; J. W. Parham, Pl. Fiji Isl. 167. 1964, ed. 2. 236. 1972.

FIGURE 118.

Atalantia sp. A. C. Sm. in Bishop Mus. Bull. 141: 77. 1936.

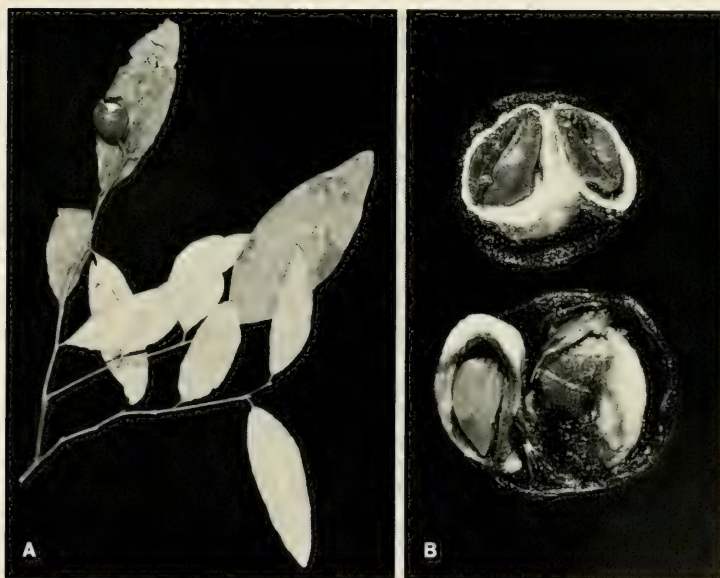


FIGURE 118. *Wenzelia kambarae*; A, distal portion of branchlet, with foliage and a fruit, $\times 1/4$; B, 2 halves of 2 different fruits, the upper fruit (smaller) showing 2 seeds cut transversely, each showing 2 cotyledons, the lower fruit (larger) showing 1 intact seed (on right) and 1 longitudinally cut seed (on left) with a section through a cotyledon, $\times 1$. A from *Smith 1293*, B from *Smith 1265*.

A shrub or slender tree 4-7 m. high, thus far known only from three islands in the Lau Group, occurring in forest on limestone at elevations up to 100 m. The leaves have petioles usually 4-7 mm. long and blades prevalingly oblong-elliptic and 6-22 × 3-9.5 cm. The sepals and petals, insofar as observed from the only known and immature flowers, are each 3, and the stamens are 8; the petals are probably white; and the ovary is said to be 3- or possibly 4-locular, but from fruits it would appear that only 2 locules sometimes develop, each with a single seed. The fruits, orange at apparent maturity, are subglobose to ellipsoid or obovoid, 3-5 cm. in diameter, borne on pedicels elongating to 1.5 cm. or more and on an elongating disk (carpophore) to 2.5 mm. long; the pericarp is copiously glandular; and the seeds are large, to 3 × 2 cm., ovoid, with a smooth, cream-colored testa. Flower buds have been obtained in August, fruits in March and September.

TYPIIFICATION: The type is *Smith 1265* (NY HOLOTYPE; ISOTYPES at BISH, K, P), collected March 2, 1934, in forest on limestone on Kambara.

DISTRIBUTION: Endemic to Fiji and perhaps to the Lau Group, where it may be anticipated on other islands than the three here mentioned.

LOCAL NAME: *Molimoli*.

AVAILABLE COLLECTIONS: TUVUTHA: Interior forest on slopes of limestone hills, *Bryan 547* (BISH, 2 sheets). NAYAU: *E. C. Zimmerman*, Aug. 22, 1938 (NA). KAMBARA: In forest on limestone, *Smith 1293* (BISH, NY, K, and 8 other depositories).

According to Swingle (1940, p. 14), Zimmerman was told by inhabitants of Lau that the flowers of the *molimoli* sometimes bore pink and red flowers, but otherwise *Wenzelia* always has flowers with white petals. I believe that the stated information is erroneous, as the name *molimoli* may loosely refer to any species of *Citrus* or related genera. Swingle did not see the Bryan specimens, which had been referred to the genus *Pamburus* by Tanaka (in herb. BISH).

9. CITRUS L. Sp. Pl. 782. 1753; Seem. Fl. Vit. 32. 1865; Engl. in Engl. & Prantl, Nat.

Pflanzenfam. ed. 2. 19a: 333. 1931; Swingle in Webber & Batchelor, Citrus Industry 1: 386. 1943; Tanaka, Sp. Prob. Citrus, 29. 1954; Purseglove, Trop. Crops, Dicot. 495. 1968.

Small trees or shrubs, the young branchlets often angled and with axillary, single spines, the older branchlets often spineless; leaves alternate, 1-foliolate, the petioles usually winged or obviously margined and articulated with leaf blades, rarely wingless and not so articulated, the blades usually without conspicuous veinlet reticulation; inflorescences axillary, corymbose-racemose and short or 1-flowered, the flowers ♂ or ♂ by partial or complete abortion of pistil, fragrant; calyx cupuliform, (3-)-4- or 5-lobed; petals 4-8 (usually 5), imbricate in bud, thick, linear or oblong, conspicuously glandular-punctate; disk annular or cupuliform, short; stamens usually at least 4 times as many as petals, sometimes 6-10 times as many, the filaments cohering in phalanges or free, the anthers oblong, sagittate; ovary subglobose, (8-)-10-14(-18)-locular, the ovules 4-12 per locale, 2-seriate, the style cylindrical, sharply distinct from ovary or gradually merging with it, abruptly expanding into the subglobose or capitate stigma, the stigma with small oil glands; fruit a hesperidium (a syncarpous berry with a tough rind), the segments containing seeds near inner angle and stalked, fusiform pulp vesicles (derived from endocarp) filled with water tissue, the outer pericarp (peel) with numerous oil glands and usually becoming yellow to orange at maturity, the endocarp membranous, surrounding carpels or segments, the seeds obovoid or flattened-obovoid, sometimes polyembryonic.

LECTOTYPE SPECIES: *Citrus medica* L. (vide Britton, Fl. Bermuda, 201. 1918), one of Linnaeus's two original species.

DISTRIBUTION: Although the indigenous range of *Citrus* is sometimes considered to extend from southeastern Asia (from India and southern China) eastward to Fiji and Samoa, the eastern extension must be questioned. Certain species (e. g. *C. maxima*, *C. macroptera*) were probably aboriginally introduced into Fiji and other archipelagoes to the east and have become thoroughly naturalized, but none can be mistaken for indigenous plants. The eastern limit of indigenoussness probably lies in eastern Malaysia.

The number of species to be included in *Citrus* is very much a matter of opinion. Engler (1931) treated eleven species in considerable detail. Swingle (1943), whose work is generally followed by nonspecialists, recognizes 16 species, but Tanaka (1954, pp. 107-140) has accepted a total of 145 species. Practically all species within the genus can be artificially hybridized without difficulty. The cited works of Swingle (1943, pp. 388-393) and Tanaka (1954, pp. 99-106) summarize their conflicting viewpoints. Nine species are recorded from Fiji.

The genus *Citrus*, including oranges, lemons, and their relatives, must be considered economically one of the most important plant genera.

USEFUL TREATMENT OF GENUS: TANAKA, T. Species problem in Citrus: a critical study of wild and cultivated units of Citrus, based upon field studies in their native homes (Revisio Aurantiacearum IX), 1-152. 1954.

KEY TO SPECIES

Pulp vesicles nearly free from oil droplets and never containing acrid oil; petioles wingless or with narrow wings (or, if broadly winged, the wings distally subcordate and less than 3/4 the breadth of the leaf blades); flowers usually (1.5-) 2.5-5 cm. in diameter or larger; stamens cohering in fascicles.

Petioles wingless, short, not or imperfectly articulated with leaf blades, these elliptic, 8-20 × 3-9 cm.; flowers ♂ or ♀ with aborted ovaries; stamens 30-40; fruits oblong, (6-) 10-20 cm. long, with a very thick rind and 10-13 small segments with greenish, sour pulp; cultivated and sparingly naturalized.

1. *C. medica*

Petioles winged or margined, clearly articulated with leaf blades.

Stamens 20-40; flowers 3.8-5 cm. in diameter, ♂ or ♀ with aborted ovaries; petioles short, margined or very narrowly winged, the leaf blades long-ovate, 5-10 × 3-6 cm.; fruits ovoid or ellipsoid, up to 12 × 6 cm., with a broad apical papilla, the peel about 0.5 cm. thick, yellow when ripe, the segments 8-10, with pale yellow, sour pulp; cultivated and sparsely naturalized. 2. *C. limon*

Stamens 20-25; flowers usually ♀; petioles with broad or narrow wings.

Peel easily separating from the 10-15 fruit segments, these with sweet, juicy, orange pulp; fruits depressed-globose or subglobose, 5-8 cm. in diameter; stamens about 20; flowers small, 1.5-2.5 cm. in diameter; petioles very narrowly winged, the leaf blades ovate or elliptic to lanceolate, 4-8 × 1.5-5.5 cm.; cultivated only. 3. *C. reticulata*

Peel adherent to fruit; stamens 20-25; flowers 2-7 cm. in diameter; leaf blades ovate to elliptic.

Fruits medium-sized to small, 3.5-12 cm. in diameter, with 9-14 locules; petioles with medium-sized or narrow wings, these distally rounded but not subcordate.

Flowers small, 2-2.5 cm. in diameter; fruits small, 2.5-6 cm. in diameter, ovoid to globose, greenish yellow when ripe, the peel thin, usually 2-3 mm. thick, the pulp greenish, very acid; petioles narrowly winged, the leaf blades ovate-elliptic, 4-12 × 2-7 cm.; cultivated and sparingly naturalized. 4. *C. aurantifolia*

Flowers larger, usually more than 2.5 cm. in diameter; fruits medium-sized, 4-12 cm. in diameter, usually bright orange or scarlet-orange at maturity, the peel usually 0.5-1 cm. thick; leaf blades 5-15 × 2-8 cm.

Petioles broadly winged, 2-3 cm. long and 4-12 mm. broad across wings; fruits scarlet-orange or bright orange with a reddish tint at maturity, rough, the peel often 1 cm. thick, the pulp very sour, somewhat bitter; cultivated only. 5. *C. aurantium*

Petioles narrowly winged, 1-2.5 cm. long and 3-5 mm. broad across wings; fruits orange at maturity, smooth, the peel about 5 mm. thick, the pulp sweet; cultivated only.

6. *C. sinensis*

Fruits subglobose or pyriform, large, (8-) 10-15 (-30) cm. in diameter, with 11-16 locules, pale yellow or greenish when ripe; petioles broadly winged; leaf blades 5-20 × 2-12 cm.; flowers large, 3-7 cm. in diameter.

Petiole wings distally subcordate; petiole including wings to 5 cm. broad; fruits often pyriform, 10–30 cm. in diameter, the peel very thick (often 2–3 cm. thick), the pulp vesicles large, usually easily separable, the seeds large, usually flat and yellowish, rough, usually with only a single embryo; cultivated and abundantly naturalized. 7. *C. maxima*

Petiole wings distally rounded but not subcordate; fruits subglobose, 8–15 cm. in diameter, the peel comparatively thin (0.5–1 cm. thick), the pulp vesicles large but coherent, the seeds white, smooth, polyembryonic; cultivated only. 8. *C. × paradisi*

Pulp vesicles containing numerous droplets of acrid oil; petioles long, broadly winged (as broad as or at least 3/4 as broad as leaf blades, 1.5–5.5 cm. across wings, each wing semiobovate, broadly obtuse or truncate-rounded at apex but not subcordate); flowers 1.3–2 cm. in diameter; stamens about 20, free; fruits subglobose, 6–7 cm. in diameter, the rind 1 cm. or more thick, the segments 10–14, with very little juice and bitter; abundantly naturalized. 9. *C. macroptera*

1. *Citrus medica* L. Sp. Pl. 782. 1753; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 337. 1931; Christophersen in Bishop Mus. Bull. 128: 111. 1935; Swingle in Webber & Batchelor, Citrus Industry 1: 396. 1943; Yuncker in Bishop Mus. Bull. 184: 44. 1945; Tanaka, Sp. Prob. Citrus, 113. 1954; J. W. Parham, Pl. Fiji Isl. 165. 1964, ed. 2. 233. 1972; Purseglove, Trop. Crops, Dicot. 504. fig. 80. 1968; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 84, 128. 1972.

In Fiji *Citrus medica* is occasionally cultivated and sparingly naturalized at elevations up to about 100 m. It is seen as a tree 3–5 m. high; the short (5–12 mm. long) petioles are wingless and not or imperfectly articulated with the leaf blades, which are elliptic, 8–20 × 3–9 cm., and serrate. The fragrant flowers have white petals pink-tinged without; the fruits are large and yellow when ripe, oblong, 10–20 cm. long, often rough and with a very thick rind, with small segments and greenish, sour pulp. Flowers and fruits are found at any season.

TYPIIFICATION: Swingle (1943) indicates that a type is lacking; Linnaeus apparently described the species from a cultivated plant.

DISTRIBUTION: The original nativity of the citron is uncertain, but it was spread early, having been known in Babylon by 4000 B. C. It is now cultivated in tropical and subtropical areas. However, it was not noted by the earlier collectors in Fiji and was probably a comparatively recent introduction.

LOCAL NAMES AND USES: The *citron* is also locally known as *moli* or *moli karokaro*. The fruit resembles a rough-skinned lemon and is sometimes eaten by Fijians, although it is presumably not very palatable. The rind may be used in various ways, often being candied.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Viria, *Meebold 16487*. VANUA MBALAVU: Between Lomaloma and Ndakuilomaloma, *Garnock-Jones 1088*. TUVUTHA: *Bryan 545*. LAKEMBA: Near Tumbou, *Garnock-Jones 895*.

2. *Citrus limon* (L.) Burm. f. Fl. Ind. 173. 1768; Swingle in Webber & Batchelor, Citrus Industry 1: 398. 1943; Tanaka, Sp. Prob. Citrus, 114. 1954; J. W. Parham, Pl. Fiji Isl. 164. 1964, ed. 2. 233. 1972; Purseglove, Trop. Crops, Dicot. 502. fig. 79. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 182. 1970; St. John & A. C. Sm. in Pacific Sci. 25: 331. 1971.

Citrus medica var. *limon* L. Sp. Pl. 782. 1753.

In Fiji the lemon is seen from near sea level to an elevation of about 550 m., being cultivated and sometimes naturalized in waste places, pastures, and canefields, and on open hills, as a tree or shrub 1–9 m. high. Its leaves have short (5–10 mm. long) petioles, margined or very narrowly winged, and ovate, serrate blades 5–10 × 3–6 cm. The flowers have white petals that are reddish-tinged in bud; the fruits are pale yellow-green when mature, up to 12 × 6 cm., with a fairly thick rind and pale yellow, sour pulp. Flowers and fruits have been noted between February and April.

TYPIFICATION: Swingle (1943) indicates that a specimen at LINN is to be taken as the type of *Citrus medica* var. *limon*. The oldest binomial for the true lemon may be *C. limonia* Osbeck (Reise Ostindien, 250. 1765), as indicated by Merrill (Interpret. Rumph. Herb. Amb. 47. 1917) and Engler (in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 338. fig. 155, G-L. 1931). Swingle (1943, p. 401) considers *C. limonia* to refer to a hybrid between *C. limon* and (?) *C. reticulata*, but Tanaka (1954, p. 114) accepts it as a separate species allied to but distinct from the true lemon.

DISTRIBUTION: The origin of the lemon is uncertain, although it may have come from southeastern Asia. It was known in the Mediterranean area by 1000 A. D., but apparently it was not an aboriginal introduction into Fiji.

LOCAL NAMES AND USES: The lemon is also known locally as *Lisbon lemon*, *moli karokaro*, *moli sosoriatia*, and *moli ni valangi*. Fruits are widely used for preparation of lemonade and for flavoring and garnish, but apparently those of naturalized plants are very bitter.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Ndreketi, Lautoka, DA 11756; Ambatha Village, DA 14818. NAITASIRI: Vunindawa, DA 10018. 10019; Toninaiwau, Tholo-i-suva, DA 16653; Tamavua, DA 4057.

3. ***Citrus reticulata*** Blanco, Fl. Filip. 610. 1837; Swingle in Webber & Batchelor, *Citrus Industry* 1: 413. 1943; Tanaka, Sp. Prob. *Citrus*, 131. 1954; J. W. Parham, Pl. Fiji Isl. 165. 1964, ed. 2. 233. 1972; Purseglove, *Trop. Crops, Dicot.* 508. fig. 82. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 183. 1970; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 84. 1972.

Citrus nobilis sensu Andrews in Bot. Repos. 9: pl. 608. 1809; Christophersen in Bishop Mus. Bull. 128: 111. 1935; Yuncker in op. cit. 178: 70. 1943; St. John & A. C. Sm. in Pacific Sci. 25: 331. 1971; non Lour. (1790).

The mandarin occurs in Fiji in cultivation only at elevations up to about 250 m., as a sometimes spiny tree 4-9 m. high. The leaves have petioles 5-15 mm. long, narrowly winged or margined, 1.5-3 mm. broad across the wings; the blades are ovate to lanceolate, 4-8 × 1.5-5.5 cm., and usually crenate. The petals are white, the fruits depressed-globose or subglobose, 5-8 cm. in diameter, with thin, loose peel easily separating from the segments, bright orange or scarlet-orange when fully ripe but in some forms greenish with yellow patches, with sweet, juicy, orange pulp. Fruits seem best in Fiji between February and May.

TYPIFICATION: Because Blanco's specimens have disappeared, the substitute type (NEOTYPE) may be considered Merrill, *Species Blancoanae* 402, from Luzon, Philippines (Swingle, 1943).

DISTRIBUTION: Southeastern Asia, the Philippines, and presumably other parts of Malasia, now widely cultivated in tropical and subtropical areas. It is presumably a fairly recent introduction into Fiji. According to Swingle (1943), *Citrus reticulata* is the correct name for the true mandarin, with thin, loose peel, and is very different from *C. nobilis*, which Loureiro described as having a thick, succulent, sweet, edible, and irregularly tuberculate rind. Loureiro was apparently describing what is called King (or King of Siam) orange in the United States, the Cochinchinese orange. Swingle takes the King orange to be a hybrid between the mandarin and some other *Citrus*, possibly a sweet orange or a pummelo.

LOCAL NAMES AND USE: The mandarin or tangerine is locally known as *mandarini*, *moli mandarini*, and *narangi*. Mandarin and tangerine are sometimes used indiscriminately, but in general the former is applied to cultivars with yellowish or pale orange

fruits, the latter to cultivars with deep orange-red fruits. The fruit is a general favorite, easily peeled and with separating segments.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Toninaiwau, Tholo-i-suva, DA 16652. REWA: 4.5 miles along King's Road, DA 12076; Samambula A-Camp, DA 6099. FIJI without further locality, DA, Jan. 28, 1950.

4. *Citrus aurantifolia* (Christm.) Swingle in J. Wash. Acad. Sci. 3: 465. 1913; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 340, as *C. aurantiifolia*. 1931; Christophersen in Bishop Mus. Bull. 128: 111. 1935; Swingle in Webber & Batchelor, Citrus Industry 1: 401. 1943; Yuncker in Bishop Mus. Bull. 178: 70. 1943, in op. cit. 184: 44. 1945; Tanaka, Sp. Prob. Citrus, 110. 1954; J. W. Parham, Pl. Fiji Isl. 164. 1964, ed. 2. 232. 1972; Purseglove, Trop. Crops, Dicot. 499. fig. 76. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 182. 1970; St. John & A. C. Sm. in Pacific Sci. 25: 330. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 84, 128. 1972.

Limonia aurantifolia Christm. Vollst. Pflanzensyst. 1: 618. 1777.

Citrus limonum sensu Seem. Viti, 434. 1862, Fl. Vit. 32. 1865; non Risso.

As seen in Fiji, the lime is cultivated but also naturalized on edges of forest from near sea level to about 250 m., as a tree 4–8 m. high, usually with copious, short spines. The leaves seem very variable in what appear to be different cultivars; as seen in the Fijian Region the petioles may be 5–18 mm. long and 1.5–6 mm. broad across the wings, and the blades vary from 4 × 2 cm. to 12 × 7 cm. The flowers have pale pink or white petals, and the fruits are ovoid or globose, 3.5–6 cm. in diameter and greenish yellow when ripe, with thin, adherent peel and greenish, very acid fruit. Fruits occur during much of the year.

TYPIFICATION: *Limonia aurantifolia* was based at least in part on Rumph. Herb. Amb. 2: 107. t. 29. 1741.

DISTRIBUTION: Presumably indigenous in Malesia, the lime has spread throughout the tropics and subtropics. Seemann (1965), erroneously using the name *Citrus limonum*, indicated that the lime was introduced from Tahiti in 1823; apparently he did not preserve a specimen.

LOCAL NAMES AND USES: The lime is also known as *moli kara*, *laimi*, and *moli laimi*. Some cultivars are seedless. Limes are extensively used for fresh juice, for flavoring foods, and for marmalade.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Toninaiwau, Tholo-i-suva, DA 16650. KANDAVU: Hills above Namalata and Ngaloa Bays, Smith 74.

5. *Citrus aurantium* L. Sp. Pl. 782. 1753; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 342. fig. 155, A–F. 1931; Christophersen in Bishop Mus. Bull. 128: 111. 1935; Swingle in Webber & Batchelor, Citrus Industry 1: 402. 1943; Yuncker in Bishop Mus. Bull. 178: 70. 1943, in op. cit. 184: 44. 1945; Tanaka, Sp. Prob. Citrus, 123. 1954; J. W. Parham, Pl. Fiji Isl. 164. 1964, ed. 2. 232. 1972; Purseglove, Trop. Crops, Dicot. 500. fig. 77. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 182. 1970; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 83. 1972.

Citrus limonia sensu Yuncker in Bishop Mus. Bull. 178: 70, as *C. limona*. 1943; non Osbeck.

Known only in cultivation in Fiji, *Citrus aurantium* is found near sea level as a tree to 10 m. high. The leaves have petioles 20–30 mm. long and 4–12 mm. broad across wings, the blades being ovate to elliptic, 5–15 × 3–8 cm. The very fragrant flowers have white petals, and the fruits are subglobose, usually 5–9 cm. in diameter, somewhat

rough-skinned and with a thick peel, becoming bright orange with a reddish tint at maturity, and with sour and bitter pulp.

TYPIFICATION: Several references were given by Linnaeus; Swingle (1943) indicates a specimen (LINN) presumably cultivated in Europe as the type.

DISTRIBUTION: Presumably a native of southeastern Asia, *Citrus aurantium* was introduced into the Mediterranean area about the eleventh century and was later confused with *C. sinensis*, the sweet orange, which, however, did not reach Europe until a few centuries later (Swingle, 1943). It was presumably an early European introduction into Fiji. Although no vouchers have been located, *C. aurantium* is occasionally seen in gardens.

LOCAL NAMES AND USES: *Sour orange*, *Seville orange*, *moli jamu*. Sour oranges are too bitter to use as fresh fruits but are used in flavoring, for marmalade, and in some areas for medicinal purposes.

6. ***Citrus sinensis*** (L.) Osbeck, *Reise Ostindien*, 250. 1765; Engl. in Engl. & Prantl, *Nat. Pflanzenfam.* ed. 2. **19a**: 340. 1931; Swingle in Webber & Batchelor, *Citrus Industry I*: 411. 1943; Yuncker in Bishop Mus. Bull. **178**: 70. 1943; J. W. Parham in Agr. J. Dept. Agr. Fiji **19**: 101. 1948; Tanaka, *Sp. Prob. Citrus*, 124. 1954; J. W. Parham, *Pl. Fiji Isl.* 165. 1964, ed. 2. 233. 1972; Purseglove, *Trop. Crops, Dicot.* 510. *fig. 83*. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 183. 1970; St. John & A. C. Sm. in *Pacific Sci.* **25**: 331. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 84. 1972; St. John in *Phytologia* **36**: 369. 1977.

Citrus aurantium var. *sinensis* L. *Sp. Pl.* 783. 1753.

Citrus aurantium sensu Seem. *Viti*, 434. 1862, *Fl. Vit.* 32. 1865; non L.

The sweet orange is found only in cultivation in Fiji, at elevations up to 250 m. and doubtless higher, as an often spiny tree 6–12 m. high. Its leaves have petioles 1–2.5 cm. long and 3–5 mm. broad across wings, and ovate to elliptic blades usually 5–15 × 2–8 cm. The fragrant flowers have white petals, and the fruits are subglobose, 4–12 cm. in diameter at maturity, orange or often remaining greenish, with an adherent peel to 5 mm. thick. The best fruiting season seems to be between March and May.

TYPIFICATION: Linnaeus's only original reference is to Bauhin's *Pinax*; no authentic specimen seems to be at LINN (Swingle, 1943).

DISTRIBUTION: Presumably indigenous in southeastern Asia, the sweet orange did not reach the Mediterranean area and Europe until the latter part of the fifteenth century. The species is perhaps the most important species of *Citrus* commercially and is known in many cultivars and as a parent of many hybrids. Seemann, misidentifying the sweet orange as *C. aurantium*, indicates that it was introduced from Tahiti in 1823, and the name *moli Tahiti* is still the most commonly used one in Fiji.

LOCAL NAMES AND USES: The *orange* or *sweet orange* is locally known as *moli Tahiti*, *moli ndawa*, *moli lethau*, and *mitha nimbu*. It is commonly cultivated, although not on a scale for export, as a dessert fruit and a source of juice and marmalade.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Toninaiwau, Tholo-i-suva, *DA 16651*.

7. ***Citrus maxima*** (Burm.) Merr. *Interpret. Rumph. Herb. Amb.* 296. 1917; Engl. in Engl. & Prantl, *Nat. Pflanzenfam.* ed. 2. **19a**: 336. 1931; Yuncker in Bishop Mus. Bull. **184**: 44. 1945, in op. cit. **220**: 154. 1959.

Citrus aurantium var. *grandis* L. Sp. Pl. 783. 1753.

Aurantium maximum Burm. Index Herb. Amb. 16. 1755.

Citrus grandis Osbeck, Dagb. Ostind. Resa, 98. 1757; Swingle in Webber & Batchelor, *Citrus Industry* 1: 417. 1943; Tanaka, Sp. Prob. Citrus, 117. 1954; J. W. Parham, Pl. Fiji Isl. 164. 1964, ed. 2. 232. 1972; Purselglove, Trop. Crops. Dicot. 502. fig. 78. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 182. 1970; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 84. 1972.

Citrus aurantium var. *decumana* L. Sp. Pl. ed. 2. 1101. 1763.

Citrus decumanus L. Syst. Nat. ed. 12. 508. 1767; Murray in L. Syst. Nat. ed. 13. 580. 1774.

Citrus decumana L. ex A. Gray, Bot. U. S. Expl. Exped. 1: 236. 1854; Seem. Viti, 434. 1862, Fl. Vit. 33. 1865.

In Fiji *Citrus maxima* is seen as a spiny tree 3–12 m. high, sometimes cultivated but more often abundantly naturalized in sometimes dense forest, often along streams, from near sea level to an elevation of about 800 m. The leaves have petioles (15–) 30–50 mm. long and (6–) 10–40 mm. broad across wings, these being distally subcordate, and ovate to elliptic blades (6–) 10–20 × (4–) 5–10 cm. The petals and filaments are pure white, the anthers yellow, and the stigma pale green. The fruits are globose to pyriform, 10–30 cm. in diameter, with a very thick peel and pale yellow or pink pulp. Flowers and fruits occur throughout the year.

TYPIFICATION: *Aurantium maximum* is typified by *Limo decumanus* Rumph. Herb. Amb. 2: 96. t. 24, fig. 2. 1741, and Burman's name provides the oldest valid epithet at the specific level for the species frequently known as *Citrus grandis* (L.) Osbeck, which is based on *C. aurantium* var. *grandis* L., for which Linnaeus cited a reference to Sloane (1707). An Osbeck specimen (s) from China can scarcely be taken as the type of *C. grandis*, as stated by Swingle (1943). *Citrus aurantium* var. *decumana* seems based on the Sloane reference, but Linnaeus apparently based *C. decumanus* on the Rumphian concept.

DISTRIBUTION: Probably indigenous in southeastern Asia and Malesia, now widely cultivated and naturalized throughout the tropics and subtropics. It was presumably an aboriginal introduction into Fiji and other Pacific areas.

LOCAL NAMES AND USES: The *pummelo* or *shaddock* is known to Fijians as *moli kana* or *moli kania*. The fruit is considered edible and is sometimes used as a dessert fruit, but it is also used for marmalade. The scraped root is said to be used as part of an internal remedy for hemorrhoids on Taveuni.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, *Degener 14493*; hills between Nggaliwana and Tumbleindreketi Creeks, east of the sawmill at Navai, *Smith 5895*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 12676* (*Melville et al. 7053*), *O. & I. Degener 32182*; inland from Mbalo, near Vatukarasa, *O. & I. Degener 32187*. SERUA: Namboutini, *DA 13770* (*DF 455, Damanu 104*). NAITASIRI: Toninaiwau, Tholo-i-suva, *DA 16655*. TAILEVU: Korovou, *Valentine 6*. TAVEUNI: Korovou Village, *Weiner 71-7-95a*.

8. *Citrus* × *paradisii* Macfad. in Bot. Misc. 1: 304. 1830, Fl. Jamaica 1: 131. 1837; Swingle in Webber & Batchelor, *Citrus Industry* 1: 418. 1943; Tanaka, Sp. Prob. Citrus, 118. 1954; J. W. Parham, Pl. Fiji Isl. 165. 1964, ed. 2. 233. 1972; Purselglove, Trop. Crops, Dicot. 506. fig. 81. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 183. 1970; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 84. 1972.

Citrus grandis sensu Yuncker in Bishop Mus. Bull. 178: 70. 1943; non Osbeck.

The grapefruit is seen in Fiji near sea level as a spreading tree 10–15 m. high; its leaves resemble those of *Citrus maxima* but are slightly smaller, with petiolar wings somewhat narrower and rounded but not subcordate at apex. The fruits are large, subglobose, 8–15 cm. in diameter, and greenish or pale yellow when ripe, with comparatively thin peel and sweet pulp.

TYPIFICATION: Apparently no type was preserved for the grapefruit.

DISTRIBUTION: Although the true nature of the grapefruit has been problematical, it apparently originated in the West Indies as a chance cross between *Citrus maxima* and another *Citrus* species. Swingle (1943) suggested the sweet orange (*C. sinensis*) as the probable second parent, and recent research (cf. Scora et al. in *Syst. Bot.* 7: 170-177. 1982) supports this conclusion. Most students of the group prefer to retain it as a distinct species related to the pummelo.

LOCAL NAME AND USE: The *grapefruit* is commonly cultivated in Fiji, although not on a scale for export, and was a comparatively recent introduction. No Fijian herbarium vouchers are available.

9. *Citrus macroptera* Montr. in *Mém. Acad. Roy. Sci. Lyon, Sect. Sci. II.* 10: 187. 1860; Swingle in Webber & Batchelor, *Citrus Industry* 1: 436. 1943; Tanaka, *Sp. Prob. Citrus*, 107. 1954; J. W. Parham, *Pl. Fiji Isl.* 165. 1964, ed. 2. 233. 1972; B. E. V. Parham in *New Zealand Dept. Sci. Indust. Res. Inform. Ser.* 85: 85. 1972.

Citrus vulgaris sensu Seem. in *Bonplandia* 9: 254. 1861, Viti, 434. 1862, *Fl. Vit.* 32. 1865; non Risso.

Citrus vitiensis Tanaka in *Bull. Soc. Bot. France* 75: 715. 1928, *Sp. Prob. Citrus*, 54, 55, 108. 1954.

Citrus hystrix sensu Christophersen in *Bishop Mus. Bull.* 128: 110. 1935; Yuncker in op. cit. 184: 44. 1945; B. E. V. Parham in *New Zealand Dept. Sci. Indust. Res. Inform. Ser.* 85: 84, 85. 1972; non DC.

A spreading tree 6-10 m. high, abundantly naturalized in dense or secondary forest and often locally abundant at elevations from near sea level to a few hundred meters. The leaves are unmistakable in having the winged petioles nearly as broad as the leaf blades, the petioles 1.5-5.5 cm. across, each wing semiobovate, 3-8.5 × 0.8-2.8 cm., broadly obtuse or truncate-rounded at apex but not orbiculate, the blades 5-13 × 2-6 cm. The petals and filaments are white, the anthers yellow. The fruits are subglobose and thick-skinned, about the size and shape of an orange but with very little juice of a bitter and disagreeable taste. The rind hardens and becomes stony after the fruit falls and dries. Flowers and fruits are seen throughout the year.

TYPIFICATION: The type of *Citrus macroptera* is *Montrouzier* (LY), from Île Art, New Caledonia.

Seemann referred the specimens he collected as no. 58 to *Citrus vulgaris* (= *C. aurantium*, the sour or Seville orange). One of these specimens (without locality but perhaps from the banks of the Waindina River near Namosi) clearly represents *C. macroptera* and was so annotated by Tanaka. Another specimen numbered 58 is the type specimen of *C. vitiensis* Tanaka. Tanaka has so labelled this specimen (κ) but he did not cite a number or locality; it was labelled by Seemann "Namara July 1860," and a further note on the specimen by Seemann states: "plentiful on the banks of the Namosi River." I take this latter remark to refer to the other portion of *Seemann 58*. A correct citation for the type of *C. vitiensis* is: *Seemann 58*, p. p. (κ HOLOTYPE), collected in July, 1860, on Viti Levu in the old Namara Tikina, now part of Mbau Tikina, Tailevu Province. In Viti (1862, p. 133), Seemann described visits to Namara, Koroivau, and several other parts of Viti Levu during the period he was based on Mbau Island, July 24 to Aug. 2.

As to the identity of *Citrus vitiensis*, Swingle (1943, p. 438) considered it a hybrid of *C. macroptera* probably with the pummelo (*C. grandis*, i. e. *C. maxima*). Tanaka's type specimen is sterile, with leaf blades about 6 × 2.5 cm. and petiole wings about 2 × 1 cm.; these proportions are typical for *C. macroptera*, of which I consider it merely a depauperate specimen. Tanaka (1954) again reiterated his opinion that his *C. vitiensis* is a distinct species.

DISTRIBUTION: Southeastern Asia and Malesia, perhaps indigenous as far east as New Guinea and the Bismarck Archipelago, but almost certainly an aboriginal introduction into New Caledonia and other Melanesian and Polynesian archipelagoes (for other uses than edibility). In the Pacific it has often been identified as *C. hystrix* DC., a related but less widespread species (cf. Swingle, 1943, p. 442; Burkill, Dict. Econ. Prod. Malay Penins. ed. 2. 574, 576. 1966).

LOCAL NAMES AND USES: *Moli kurukuru*, *moli kurikuri*, *moli kau*. The fruit and macerated leaves form a lather when water is added and are widely used as a hair wash; in Namosi the bark of the root is said to be used medicinally in treating "relapsed illnesses."

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Singatoka, *Greenwood 217*. NAMOSI: Hills east of Wainikoroiluva River, near Namuamua, *Smith 9061*; Namosi Village, *Weiner 10*. NAITASIRE: Central Agricultural Station, Navuso, *DA 2702*. FIJI without further locality (but probably from vicinity of Namosi, Viti Levu), *Seemann 58*, p. p.

10. *FORTUNELLA* Swingle in J. Wash. Acad. Sci. 5: 167. 1915; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 346. 1931; Swingle in Webber & Batchelor, Citrus Industry 1: 342. 1943.

Shrubs or small trees, the young branchlets angular, with or without single, axillary spines; leaves alternate, 1-foliolate, the petioles narrowly winged or merely margined, articulated or not with leaflet blade, this often thick, densely glandular-punctate, acute to retuse at apex; inflorescences axillary, fasciculate, few-flowered or flowers solitary; flowers ♀, (3-)5(-6)-merous; calyx broad, usually 5-dentate; petals acute; disk pulvinate-cylindric; stamens 15-20, irregularly cohering in phalanges, the filaments broad, tapering distally; ovary subglobose, 3-7-locular, the ovules 2 per locule, collateral, the style short, gradually or abruptly merging with ovary, the stigma capitate, with large, deep-seated oil glands; fruits comparatively small, ovoid to globose, the peel aromatic and sweet-flavored, with large, immersed oil glands, the segments 3-7, the pulp vesicles small, the seeds ovoid.

TYPE SPECIES: *Fortunella margarita* (Lour.) Swingle (*Citrus margarita* Lour.).

DISTRIBUTION: Eastern and southeastern Asia, with about four species, of which two are widely cultivated, one of them being recorded in Fiji.

Species of *Fortunella*, like those of *Citrus*, hybridize freely and with taxa of related genera, the resulting forms being very complex (Swingle, 1943, pp. 353-361).

1. *Fortunella japonica* (Thunb.) Swingle in J. Wash. Acad. Sci. 5: 171. 1915, in Webber & Batchelor, Citrus Industry 1: 347. 1943; J. W. Parham, Pl. Fiji Isl. 166. 1964, ed. 2. 235. 1972; Purselove, Trop. Crops, Dicot. 493. 1968; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 84. 1972.

Citrus japonica Thunb. in Nova Acta Regiae Soc. Sci. Upsal. 3: 199. 1780.

A thorny tree or shrub 3-9 m. high, occasionally cultivated at elevations up to about 300 m., with white petals and a fruit about 2.5 cm. in diameter, globose, and bright orange when mature. The only available collection was in fruit in May.

TYPIFICATION: The type, from a cultivated plant, presumably exists in the Thunberg Herbarium at UPS (Swingle, 1943).

DISTRIBUTION: Although it is known only in cultivation, *Fortunella japonica* is considered by Swingle to have been indigenous in southern China.

LOCAL NAMES AND USES: *Kumquat*; Swingle (1943) calls this species the *round kumquat*, the other commonly cultivated *Fortunella* being *F. margarita* (Lour.)

Swingle, the *oval kumquat*. The whole fruits may be eaten fresh, preserved in syrup, candied, or used for making marmalade. The plant is also ornamental and is sometimes used in hedges.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Toninaiwau, Tholo-i-suva, DA 16654.

11. *Aegle* Correa in Trans. Linn. Soc. 5: 222. 1800; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 349. 1931; Swingle in Webber & Batchelor, Citrus Industry 1: 453. 1943. Nom. cons.

Small tree, with axillary thorns, the branchlets dimorphic, with leaves of two sizes; leaves alternate, sometimes fascicled, 3-foliolate (rarely 5-foliolate), deciduous, the petioles distinctly or narrowly winged, the leaflets articulated with petiole, the blades ovate-lanceolate, herbaceous, pellucid-glandular, shallowly crenate-serrate; inflorescences axillary and terminal, laxly fasciculate or racemose and few-flowered or the flowers solitary, the pedicels short, the flowers ♂, 4- or 5-merous, large, fragrant; calyx small, shallow, caducous, the lobes short and broad; petals large, imbricate, oblong-ovate, rounded at apex; disk small, annular; stamens 30-50 or more, 6-10 times as many as petals, the filaments subulate, the anthers linear-lanceolate, long, sagittate at base; ovary cylindrical, tapering into style, 8-20-locular, the ovules numerous, biseriate in each locule, the style short, thick, the stigma capitate to cylindrical, longitudinally furrowed; fruits globose or subglobose, the pericarp hard, woody, the segments 8-20, narrow, with thickened and fleshy lateral walls, each with 6-10 or more seeds embedded in transparent, glutinous gum, the seeds oblong, slightly flattened, woolly, with a single embryo.

TYPE SPECIES: *Aegle marmelos* (L.) Correa (*Crataeva marmelos* L.).

DISTRIBUTION: Southeastern Asia, with a single species which is now cultivated and sometimes naturalized elsewhere, as in Fiji.

1. *Aegle marmelos* (L.) Correa in Trans. Linn. Soc. 5: 223. 1800; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 350. fig. 159. 1931; Swingle in Webber & Batchelor, Citrus Industry 1: 453. fig. 69. 1943; Greenwood in J. Arnold Arb. 25: 398. 1944; J. W. Parham, Pl. Fiji Isl. 164. 1964, ed. 2. 232. 1972; Purseglove, Trop. Crops, Dicot. 493. 1968.

Crataeva marmelos L. Sp. Pl. 444. 1753.

As seen in Fiji, *Aegle marmelos* is a tree 5-18 m. high, cultivated and sparingly naturalized along roadsides at elevations up to about 150 m. The fragrant flowers have pale cream-green petals; the fruits are green or yellowish, 4-6 cm. or more in diameter, with a hard pericarp and with numerous white seeds embedded in soft tissue that becomes hard and orange-red when dry. Fruits were obtained in April and May.

TYPIFICATION: Linnaeus's first reference is to Fl. Zeyl. 211. 1747, and the type may be taken as *Hermann* (BM HOLOTYPE), from Ceylon.

DISTRIBUTION: Presumably indigenous in India, now widely naturalized in adjacent parts of Asia and cultivated and often naturalized elsewhere. It may have been introduced into Fiji by J. B. Thurston, being listed in his 1886 *Catalogue*.

LOCAL NAMES AND USES: *Bael* or *bel* (Hindi); the fruit pulp may be eaten fresh or used in making drinks and sherbets. Many parts of the plant are used medicinally, as discussed in Burkill's interesting treatment (Dict. Econ. Prod. Malay Penins. ed. 2. 55-59. 1966).

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Lautoka, Greenwood 970. NANDRONGA & NAVOSA: Navula, Singatoka Valley road, DA 11402. RA: Roadside near Penang, DA 7059. NAITASIRI: Ngerenggere, DA 5626. REWA: Beach road, Suva Point, DA 16482.

12. *LIMONIA* L. Sp. Pl. ed. 2. 554. 1762.

Feronia Correa in Trans. Linn. Soc. 5: 224. 1800; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 354. 1931; Swingle in Webber & Batchelor, Citrus Industry 1: 465. 1943.

Often polygamomonocious tree, the spines axillary, short, straight, the young branchlets and foliage minutely appressed-pilose, soon glabrate; leaves alternate, imparipinnate, often deciduous, the petiole and rachis winged, the rachis segments articulated at bases of leaflets, the leaflets 5 or 7, opposite, subsessile, the blades ovate to obovate, pellucid-glandular, entire to crenulate; inflorescences axillary or terminal, loosely paniculate, the flowers ♀ or ♂ by abortion, (4-)5(-6)-merous; calyx small, flat, dentate, caducous; petals spreading, oblong to ovate-lanceolate, imbricate in bud, accrescent during anthesis; disk short, finely pilose; stamens usually twice as many as petals, the filaments dilated, copiously tomentose and coherent proximally, subulate at apex, the anthers large, linear-oblong, basifixed; ovary globose, incompletely 4-6(-7)-locular (empty in ♂ flowers), becoming 1-locular with parietal placentae, the ovules very numerous, borne in several series at angles of incomplete ovary walls, the style short, thick, attenuate, the stigma oblong-fusiform; fruits large, globose, with a woody shell, unilocular, the parietal placentae bearing numerous seeds surrounded by gumlike pulp, the seeds oblong, compressed, the testa thin, pilose.

TYPE SPECIES: The type species of *Limonia* is *L. acidissima* L. (*Schinus limonia* L.); that of *Feronia* is *F. elephantum* Correa.

DISTRIBUTION: India and Ceylon, with a single species now widely cultivated, as in Fiji, and sometimes naturalized.

Limonia L. has sometimes (cf. Swingle, 1943) been considered a nomen confusum and *Feronia* Correa used in its place for the single species that it includes. However, Swingle's arguments for rejecting the generic name *Limonia* must be discounted in view of current editions of ICBN. A proposal by Panigrahi (in Taxon 26: 576-577. 1977) to reject the binomial *Limonia acidissima* L. as a nomen ambiguum has been answered by Stone and Nicolson (in Taxon 27: 551-552. 1979). These two recent discussions adequately summarize the case. It seems unlikely that any confusion will be caused by the use of Linnaeus's nomenclaturally correct binomial.

1. *Limonia acidissima* L. Sp. Pl. ed. 2. 554. 1762; Alston in Trimen, Handb. Fl. Ceylon 6: 41. 1931; Stone & Nicolson in Taxon 27: 551. 1979.

Schinus limonia L. Sp. Pl. 389. 1753.

Feronia elephantum Correa in Trans. Linn. Soc. 5: 225. 1800.

Feronia limonia Swingle in J. Wash. Acad. Sci. 4: 328. 1914; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 355. fig. 164. 1931; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 13: 51. 1942; Swingle in Webber & Batchelor, Citrus Industry 1: 466. fig. 73. 1943; J. W. Parham in Dept. Agr. Fiji Bull. 35: 97. 1959. Pl. Fiji Isl. 166. 1964, ed. 2. 235. 1972; Purselglove, Trop. Crops, Dicot. 493. 1968.

Limonia elephantum Panigrahi in Taxon 26: 577. 1977.

In Fiji *Limonia acidissima* is seen as a spiny, deciduous tree to about 9 m. high, occasionally cultivated and sometimes naturalized in waste places. The flowers are dull red or reddish, the fruits brown or whitish, up to 8 cm. in diameter, with a hard, woody rind and pinkish, aromatic pulp. Fruits are known to occur in February.

TYPIFICATION: The type of *Schinus limonia* and *Limonia acidissima* is Hermann (BM SYNTYPES, vol. 1, p. 76, and vol. 2, p. 8) (Stone and Nicolson, 1979); that of *Feronia elephantum* has not been traced (Panigrahi, 1977).

DISTRIBUTION: Indigenous in India and Ceylon, but now cultivated in southeastern Asia, Malesia, and elsewhere, and sometimes naturalized. It was supposedly introduced into Fiji about 1880 (B. E. V. Parham, 1942).

LOCAL NAMES AND USES: The wood apple or elephant apple is known in Fiji as *vakandra*, and Hindi names *kabut*, *kabeet*, and *vellam pelam* have been noted. The

acid pulp may be used in the preparation of jellies, chutney, refreshing drinks, and sherbets.

AVAILABLE COLLECTIONS: VANUA LEVU: THAKAUNDRIVE: Mbuthalevu, *DA 16405*. FIJI without further locality, *DA 3781*. The species is said (J. W. Parham, 1959) to form dense thickets on parts of Ovalau and to be occasionally found on Viti Levu.

FAMILY 138. MELIACEAE

MELIACEAE Juss. Gen. Pl. 263, as *Meliae*. 1789.

Trees or shrubs, estipulate, sometimes functionally dioecious or monoecious, the indument of simple or stellate hairs or peltate scales; leaves alternate, usually spirally arranged or clustered at apices of branchlets, imparipinnate or paripinnate, sometimes unifoliolate, infrequently trifoliolate, simple, or bi- or tripinnate, the leaflet blades usually entire, sometimes dentate, crenate, or lobed; inflorescences usually axillary, infrequently terminal or borne on branches or stems, paniculate or thyrsoid, less often racemose, spicate, or fasciculate, rarely 1- or 2-flowered; flowers actinomorphic, hypogynous, ♂ or functionally unisexual; calyx shallowly or deeply (2-)4- or 5(-7)-lobed, rarely truncate or closed and circumscissile, sometimes with free sepals, the lobes or sepals often imbricate; petals (3-) 4 or 5 (-14), free or infrequently connate proximally, sometimes partially fused to filament tube, imbricate, contorted, or valvate, usually reflexed at maturity; filaments usually completely or partially connate into a tube (this often with distal lobes or appendages), rarely completely free, the anthers (3-) 5-10 (-25), usually in a single whorl borne apically on filaments or filament tube or partially or completely included within it, 2-celled, longitudinally dehiscent (lacking pollen in ♀ flowers); disk intrastaminal, sometimes conspicuous, often tubular to cyathiform, sometimes fused to filament tube or ovary, rarely negligible or absent; ovary (1 or)2-5(-20)-locular, the placentation usually axile, the ovules 1-many per locule (rudimentary in ♂ flowers), if 2 collateral or superposed, if many biseriate, anatropous to orthotropous, usually pendulous and epitropous, the style slender to columnar, long to short, the stigma often capitate or discoid, sometimes lobed or variously shaped; fruit a berry or capsule, less often a drupe or nut, the seeds sometimes winged, if unwinged then usually with a fleshy arillode or sarcotesta, with or without endosperm, the cotyledons often plano-convex or flat.

DISTRIBUTION: Pantropical and subtropical, rarely extending into warm temperate areas, with about 51 genera and probably more than 1,000 species. The family is economically important for several genera with timber of high quality. Nine genera are known to be present in Fiji, four of them with indigenous species, the others with cultivated or infrequently naturalized species.

USEFUL TREATMENTS OF FAMILY: CANDOLLE, C. DE. *Meliaceae*. DC. *Monogr. Phan.* 1: 399-752. 1878. HARMS, H. *Meliaceae*. Engl. & Prantl, *Nat. Pflanzenfam.* ed. 2. 19b1: 1-172. 1940. SMITH, A. C. *Studies of Pacific Island plants*, X. The *Meliaceae* of Fiji, Samoa, and Tonga. *Contr. U. S. Nat. Herb.* 30: 469-522. 1952. PENNINGTON, T. D., & B. T. STYLES. A generic monograph of the *Meliaceae*. *Blumea* 22: 419-540. 1975. PENNINGTON, D. T. (with B. T. STYLES & D. A. H. TAYLOR). *Meliaceae*. *Fl. Neotropica* 28: 1-470. 1981.

The valuable generic monograph of the *Meliaceae* by Pennington and Styles (1975) will probably stand for a long period as a definitive statement of generic limits and arrangement; it recognizes 51 genera in four subfamilies. Harms (1940) had recognized 50 genera, but eight have been described since 1940, and therefore Pennington and Styles have made a few reductions. At the level of species there is greater disagreement as to limits, Pennington and Styles indicating that the family probably comprises no more than 550 species. Harms's 1940 estimate had been about 1,400 species, a figure generally accepted as reasonable in the interval between the two studies. Specific delimitation is certainly a matter upon which taxonomists may remain far apart, but in

the present family, prior to thorough revisions of several large genera, an estimate of 550 species seems unduly conservative. It is not realistic to imply that overlapping characteristics in every case prohibit the recognition of taxa at the specific level. If one should propound that all species must be distinct from their congeners in all features, a species concept would be unattainable in most genera of flowering plants, and the genus would become the lowest category to mirror reality. It would seem logical to take into consideration such dispersal barriers as distance, water expanses, topography, time, and many other isolating factors in the recognition of taxa that, however superficially similar, are quite recognizable to many observers as "species," albeit with occasional overlapping characteristics.

KEY TO GENERA

- Ovary locules with 1 or 2 ovules (in all our species, but sometimes as many as 10 in other species of *Vavaea*); fruit a drupe, berry, or loculicidal capsule, the seeds unwinged.
- Fruit a drupe, the seeds without arillodes; leaves pinnate or more finely divided, the leaflet blade margins incised or serrate, less often entire; filaments completely connate into a cylindrical tube with appendages; cultivated and sparingly naturalized.
- Leaves bi- or tripinnate; ovary 4-8-locular, each locule with 2 superposed ovules, the stigma with 4-8 short lobes; drupe with 3-8 seeds, the endocarp thick and bony. 1. *Melia*
- Leaves pinnate; ovary 3-locular, each locule with 2 collateral ovules, the stigma with 3 partially fused, obvious lobes; drupe 1 (or 2)-seeded, the endocarp thin, cartilaginous. 2. *Azadirachta*
- Fruit a berry or a loculicidal capsule (rarely a nut, but not in our species), the seeds with an arillode or sarcotesta; leaves pinnate, trifoliolate, unifoliolate, or simple, the leaflet or leaf blades entire; filaments connate into a tube (apically entire to dentate or with short appendages) or only proximally connate; indigenous.
- Leaves simple; indument of simple hairs; flowers usually ♂; filaments connate proximally into a cyathiform or cylindrical tube, free distally; disk inconspicuous, confluent with base of filament tube; fruit a berry, usually with 1-4 seeds, each with a thin sarcotesta. 3. *Vavaea*
- Leaves pinnate, trifoliolate, or unifoliolate; flowers often functionally unisexual; filament tube complete, the anthers sessile on or within it.
- Indument of stellate hairs or peltate scales; calyx shallowly to deeply lobed, not subtended by bracteoles; disk inconspicuous or lacking; fruit a berry (in all our species), usually with 1-4 seeds. 4. *Aglaia*
- Indument of simple hairs; calyx shallowly to deeply lobed or sepals free, sometimes closely subtended by imbricate bracteoles; disk well developed, usually tubular and surrounding ovary and base of style; fruit a capsule, tardily loculicidally 2-5-valved, each locule with 1 or 2 seeds. 5. *Dysoxylum*
- Ovary locules with (2-) 3-many ovules; fruit a septifragal capsule with a central columella and winged seeds or with a rudimentary columella and unwinged seeds with a thick, corky testa; leaves pinnate.
- Capsule with a conspicuous central columella and winged seeds; ovary with 8 or more ovules per locule; cultivated only.
- Flowers with an androgynophore (long, columnar disk), the petals adnate to it by a median carina; stamens 5, the filaments free but proximally adnate to androgynophore; ovary borne at apex of gynophore; capsule dehiscing from apex, the seeds terminally winged. 6. *Cedrela*
- Flowers without an androgynophore but with a pulviniform or patelliform disk; filaments completely connate into an urceolate to cupuliform tube bearing 8-10 anthers distally within it.
- Capsule subglobose, scarcely longer than broad, dehiscing from apex, the seeds narrowly circumalate; filament tube with marginal appendages imbricate at base; disk fused to base of ovary, free from filament tube. 7. *Khaya*
- Capsule ovoid to obovoid, at least twice as long as broad, dehiscing from base or from both base and apex simultaneously, the seeds winged at proximal end; filament tube with marginal appendages not imbricate; disk fused to base of filament tube, forming an annulus around ovary. 8. *Swietenia*
- Capsule large, subglobose, leathery, tardily dehiscing by 4 valves, the columella rudimentary, the seeds 8-20, pyramidal or tetrahedral, unwinged, with a corky testa; filaments completely connate into an urceolate to subglobose tube, the anthers 8, included within filament tube near its apex; disk pulviniform or cupuliform, fused to ovary, free from filament tube; ovary with (2-) 3 or 4 (-6) ovules per locule; indigenous, occurring only near sea level. 9. *Xylocarpus*

1. *MELIA* L. Sp. Pl. 384. 1753; C. DC. in DC. Monogr. Phan. **1**: 450. 1878; Harms in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **19b1**: 99. 1940; Penn. & Styles in *Blumea* **22**: 463. 1975; Penn. in *Fl. Neotropica* **28**: 24. 1981.

Polygamomonocious small trees or shrubs, the indument of simple and stellate hairs; leaves bi- or tripinnate, the leaflets numerous; inflorescences axillary, paniculate, many-flowered, the flowers ♀ and ♂; calyx 5 (or 6)-lobed nearly to base, the lobes sometimes proximally imbricate; petals 5 (or 6), free, imbricate; filaments connate into a narrowly cylindrical tube, this 10 (or 12)-ribbed, with slender, filiform, truncate, or 2-4-lobed appendages as many as or twice as many as anthers, the anthers 10 (or 12), inserted on margin or just within filament tube, basifixed; disk annular or patelliform, free, surrounding base of ovary; ovary 4-8-locular, the ovules 2 per locule, superposed, the style slender, the stigma capitate to coroniform, with 4-8 short lobes; fruits drupaceous, 3-8-locular, the endocarp thick, bony, the seeds 1 (or 2) per locule, laterally compressed, the testa crustaceous.

LECTOTYPE SPECIES: *Melia azedarach* L. (vide Britton, *Fl. Bermuda*, 204. 1918).

DISTRIBUTION: Paleotropical and subtropical, extending into Malesia and northern Australia, with 5-15 species, at least one of which is widely cultivated and naturalized elsewhere, as in Fiji.

1. *Melia azedarach* L. Sp. Pl. 384. 1753; C. DC. in DC. Monogr. Phan. **1**: 451. 1878; Guillaumin in *J. Arnold Arb.* **14**: 55. 1933; Harms in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **19b1**: 99. *fig. 26, A-L*, 27. 1940; Greenwood in *Proc. Linn. Soc.* **154**: 95. 1943; Yuncker in *Bishop Mus. Bull.* **178**: 71. 1943; J. W. Parham in *Agr. J. Dept. Agr. Fiji* **19**: 99. 1948, in op. cit. **29**: 33. 1959; Yuncker in *Bishop Mus. Bull.* **220**: 157. 1959; J. W. Parham, *Pl. Fiji Isl.* 172. 1964, ed. 2. 243. 1972; Sykes in *New Zealand Dept. Sci. Indust. Res. Bull.* **200**: 119. 1970; Penn. & Styles in *Blumea* **22**: 463. *fig. 4, d*. 1975.

Tree 3-12 (-20) m. high, sometimes with a trunk to 2 m. in diameter, cultivated or sparingly naturalized at low elevations. The large leaves, sometimes to 1 m. in length, bear numerous leaflets with petiolules to 8 mm. long, the leaflet blades ovate to elliptic or lanceolate, 3-9 × 1-3 cm., acute to acuminate at apex, subentire to incised-serrate at margin. The inflorescences, 10-30 cm. long, bear fragrant flowers with the petals purple to lavender or nearly white and the filament tube dark purple; the subglobose to ellipsoid fruits are 13-20 mm. long and yellow at maturity. Flowers and fruits have been noted between December and June.

TIPIFICATION: Several prior references were listed by Linnaeus.

DISTRIBUTION: Warmer parts of the Old World; the species is now widely established and naturalized, occurring in many Pacific archipelagoes as well as in the tropical and warm temperate parts of America.

LOCAL NAMES AND USE: In Fiji the species is generally known as *Persian lilac* or *Indian lilac*; Parham (1972) also lists the names *dake* and *bakain*. The best known English names elsewhere may be *pride of India* and *Chinaberry tree*. The plant is a pleasing ornamental and shade tree, perhaps first introduced by J. B. Thurston and listed as *Melia sempervirens* in his 1886 *Catalogue*.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vicinity of Lautoka, *Greenwood 266*. NANDRONGA & NAVOSA: Singatoka, *DF 546*. NAITASIRE: Nanduruloulou, *DA, April 29, 1948*. REWA: Suva, *DA 39*; Suva Botanical Gardens, *DA 12346*; Suva, Government House, *DA L.11530*; Suva, Health Office compound, *DA 18852*. MATUKU: *Tohill & Paine 62*. FIJI without further locality, *DA 3439*.

2. *Azadirachta* A. H. L. Juss. in *Mém. Mus. Hist. Nat.* **19**: 220. 1830; C. DC. in DC. *Monogr. Phan.* **1**: 459. 1878; Harms in *Engl. & Prantl, Nat. Pflanzenfam.* ed. 2. **19b1**: 102. 1940; Penn. & Styles in *Blumea* **22**: 464. 1975; Penn. in *Fl. Neotropica* **28**: 25. 1981.

Polygamomonocious trees, the indument of simple hairs; leaves imparipinnate (or terminal leaflet aborted); inflorescences axillary, paniculate, many-flowered, the flowers ♀ and ♂; calyx 5-lobed nearly to base, the lobes imbricate; petals 5, free, imbricate; filaments connate into a cylindrical tube slightly expanded distally, the tube with 10 rounded, truncate, emarginate, or bilobed appendages, these often partially united, the anthers 10, inserted at base of and opposite appendages, basifixed; disk annular, fused to base of ovary; ovary 3-locular, the ovules 2 per locule, collateral, the style slender, the stigma expanded, with 3 partially fused, papillose lobes; fruits drupaceous, 1 (or 2)-seeded, the endocarp thin, cartilaginous, the seed ovoid, the testa thin, membranaceous.

TYPE SPECIES: *Azadirachta indica* A. H. L. Juss. (*Melia azadirachta* L.).

DISTRIBUTION: Southeastern Asia into Malesia, with two species, one of which is widely cultivated and naturalized elsewhere, as in Fiji.

1. *Azadirachta indica* A. H. L. Juss. in *Mém. Mus. Hist. Nat.* **19**: 221. *pl. 13, no. 5.* 1830; C. DC. in DC. *Monogr. Phan.* **1**: 459. 1878; Harms in *Engl. & Prantl, Nat. Pflanzenfam.* ed. 2. **19b1**: 103. 1940; J. W. Parham, *Pl. Fiji Isl.* ed. 2. 241. 1972; Penn. & Styles in *Blumea* **22**: 464. *fig. 4, e.* 1975.

Melia azadirachta L. Sp. Pl. 385. 1753.

Tree 6–12 (–25) m. high, cultivated and sparingly naturalized at low elevations. The leaves, to 40 cm. in length, have 8–18 short-petiolulate leaflets, of which the blades are inaequilaterally ovate-lanceolate, 3–10 × 1.5–4 cm., and conspicuously crenate-serrate. The inflorescences, somewhat shorter than the leaves, bear fragrant flowers; the petals and filament tube are white; and the ellipsoid fruits, about 15 mm. long, are yellow. Flowers have been noted between November and April.

TYPIFICATION: Linnaeus mentioned several earlier references.

DISTRIBUTION: Although the species is probably indigenous to a limited region extending from India into Malesia as far as Java, it is now widely cultivated and often naturalized. In Pacific archipelagoes it seems less frequently grown than *Melia azedarach*.

LOCAL NAMES AND USES: The names commonly used in Fiji are *nim* or *neem* (Hindi). The plant is an attractive shade tree, and medicinal uses are ascribed to its leaves, bark, fruits, etc. (cf. Burkill, *Dict. Econ. Prod. Malay Penins.* ed. 2. 1467–1469. 1966, as *Melia indica*). It was probably introduced into Fiji early in the present century.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Ndreketi, Lautoka, *DA 11757*. NAITASIRI: King's Road, 7 miles, *DA 7250*; Langgere, *DA 18850*. REWA: Tonga, *DA 2064*.

3. *Vavaea* Benth. in *London J. Bot.* **2**: 212. 1843; A. Gray, *Bot. U. S. Expl. Exped.* **1**: 244. 1854, in *Mem. Amer. Acad. Arts* **5**: 331. 1855; Seem. *Fl. Vit.* **35**. 1865; C. DC. in DC. *Monogr. Phan.* **1**: 645. 1878; Harms in *Engl. & Prantl, Nat. Pflanzenfam.* ed. 2. **19b1**: 97. 1940; A. C. Sm. in *Contr. U. S. Nat. Herb.* **30**: 470. 1952; Penn. in *Blumea* **17**: 357. 1969; Penn. & Styles in *op. cit.* **22**: 464. 1975.

Trees or shrubs, with indument of simple hairs; leaves often congested toward ends of branchlets, simple, the blades entire; inflorescences axillary or extra-axillary, paniculate or cymose, often long-pedunculate, the flowers ♀ or sometimes functionally ♂; calyx shallowly to deeply 4–7-lobed, the lobes sometimes slightly imbricate, usually persistent in fruit; petals (3–) 4–7, free, imbricate, eventually spreading; filaments proximally connate into a cyathiform or cylindrical tube, free distally, the tube without appendages and often copiously pilose at throat, the anthers 9–23 (seldom

more than 14 in our species), basifixed; disk inconspicuous or carnose, confluent with base of filament tube; ovary ovoid to subglobose, 2-4(-6)-locular, the locules with 1 or 2 (then collateral) ovules (as in our species) or with 4-10 biseriate ovules, the style usually slender, the stigma capitate or discoid, inconspicuously 3- or 4-lobed; fruits baccate, 2-4(-6)-locular, the pericarp usually thin and carnose, less often thick and hard, the seeds 1-8, ellipsoid or ovoid, often somewhat flattened, the testa cartilaginous, a thin sarcotesta present.

TYPE SPECIES: *Vavaea amicorum* Benth.

DISTRIBUTION: Malesia from the Philippines and Sumatra eastward to northern Australia, the Caroline Islands, Fiji, and Tonga. Four indigenous species are here recognized from Fiji. Although Pennington (1969) has accepted a total of only four species in the genus, other taxonomists, utilizing minor features and distributional patterns in the otherwise intractable *Vavaea amicorum* complex, have recognized about 25 species. Pennington has interpreted those taxa (22 described species) with few ovules, small flowers, and a comparatively slender habit as representing *V. amicorum*, assigning to it the entire generic range. His discussion of the variation pattern in this complex (1969, pp. 355-357) is interesting, but a reconsideration will probably engage some future specialist. It is of some significance, in a biogeographical consideration, that *Vavaea*, an abundant component of forest vegetation in Fiji and Tonga, has apparently been unable to cross the water barriers to the Horne and Wallis Islands or Samoa; this fact does not suggest ease of dispersibility, or that disseminules are likely to have reached Fiji from more westerly archipelagoes with such frequency as to have made inoperative the evolutionary processes normally affecting isolated populations.

USEFUL TREATMENT OF GENUS: PENNINGTON, T. D. Materials for a monograph of the Meliaceae. I. A revision of the genus *Vavaea*. *Blumea* 17: 351-366. 1969.

KEY TO SPECIES

Flowers comparatively small, the calyx at anthesis 3-5 mm. in diameter, with lobes 1-2.5 mm. long, not or slightly accrescent in fruit (calyx then up to 7 mm. in diameter, the lobes not more than 3 mm. long), the petals 5-6.5 mm. long and 1.5-2.2 mm. broad, the stamens 2.5-3 mm. long, with anthers 0.5-0.8 mm. long; branchlets comparatively slender, 4-7 mm. in diameter toward apex; petioles rarely more than 3.5 cm. long.

Leaves with obvious, slender (rarely more than 2 mm. in diameter) petioles 1-3.5 (-4.5) cm. long, the blades usually 6-15 × 2.5-8 cm. (rarely up to 18 × 11 cm.), obtuse to gradually narrowed at base, usually attenuate to acute and decurrent on petiole, rounded or obtusely cuspidate at apex, essentially glabrous beneath at maturity or sparsely pilose along costa, rarely soft-pilose on surface; calyx lobes acute to obtuse or rounded at apex, sometimes with obvious nerves; ovary closely sericeous (hairs 0.1-0.3 mm. long), the style sparsely sericeous in lower half, glabrous above.

1. *V. amicorum*

Leaves short-petiolate, often appearing sessile, the petioles comparatively stout (usually 1.5-3 mm. in diameter), 0.5-1.8 (rarely to 4) cm. long, the blades usually 11-23 × 4.5-11.5 cm. (rarely 7-29 × 3.5-17 cm.), gradually narrowed proximally but then often obtuse or subrounded at actual base and abruptly decurrent on petiole, cuspidate at apex (actual apex obtuse or acute), sometimes coarsely undulate-crenate toward apex, persistently pilose beneath; calyx lobes acute at apex, obscurely nerved; ovary sericeous, usually with hairs 0.4-0.6 mm. long, the style sparsely sericeous nearly to apex.

2. *V. harveyi*

Flowers comparatively large, the calyx at anthesis 6-10 mm. in diameter, with lobes 2.5-4 mm. long, usually slightly accrescent in fruit (calyx then up to 14 mm. in diameter, the lobes up to 5 mm. long), the petals 7-9 mm. long and 2-3 mm. broad, the stamens 3-4 mm. long, with anthers 0.7-1 mm. long; branchlets comparatively stout, 8-13 mm. in diameter toward apex, conspicuously verrucose with the scars of fallen leaves and inflorescences; petioles (1-) 2.5-8 cm. long, stout (2-4 mm. in diameter); leaf blades usually 13-30 × 7-17 cm.

Leaf blades lanceolate-obovate, gradually attenuate toward base and long-decurrent on petiole, glabrous beneath or with a strigose (not spreading) indument limited to costa and principal nerves.

3. *V. megaphylla*

Leaf blades oblong-obovate, obtuse at base and short-decurrent on petiole, uniformly and persistently soft-pilose beneath with whitish hairs 0.3-0.7 mm. long (hairs of petiole and costa also spreading, not appressed), the costa and bases of secondary nerves on upper surface also pilose.

4. *V. degeneri*

1. *Vavaea amicorum* Benth. in London J. Bot. 2: 212. 1843; Walp. Rep. Bot. Syst. 5: 377. 1846; A. Gray, Bot. U. S. Expl. Exped. 1: 244. 1854, Atlas, pl. 16, B. 1856, in Mem. Amer. Acad. Arts 5: 329. 1855; C. Muell. in Walp. Ann. Bot. Syst. 4: 388. 1857; Seem. in Bonplandia 9: 254. 1861, Viti, 434. 1862; C. DC. in Monogr. Phan. 1: 645. 1878, in Bot. Jahrb. 7: 461. 1886; Hemsl. in J. Linn. Soc. Bot. 30: 171. 1894; Burkill in op. cit. 35: 31. 1901; A. C. Sm. in Contr. U. S. Nat. Herb. 30: 472. 1952; Yuncker in Bishop Mus. Bull. 220: 156. 1959; J. W. Parham, Pl. Fiji Isl. 172. 1964, ed. 2. 244. 1972; Penn. in Blumea 17: 358, p. p. fig. 1, a-e. 1969.

FIGURE 119A & B.

Vavaea vitiensis Seem. Fl. Vit. 35. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 136. 1890.

As noted in Fiji, *Vavaea amicorum* is a usually slender tree 3–20 m. high, with a trunk to 20 cm. in diameter, often abundant in diverse habitats such as beach thickets, the inner edge of mangrove swamps, limestone cliffs, forest, the forest-grassland transition, and thickets of crests and ridges, from near sea level to about 1,150 m. The fragrant flowers have white to pale yellow or orange petals, white or pale yellow filaments or these purplish at base, and yellow anthers; fruits turn from green to black at maturity. Flowers and fruits are to be found throughout the year.

TYPIFICATION: The species is based on *Barclay* (K HOLOTYPE), collected in May, 1840, on Vava'u, Tonga. The type of *Vavaea vitiensis* is *Seemann 63* (K HOLOTYPE; ISOTYPES at BM, GH), collected in 1860 along the coast of Mathuata Province, Vanua Levu.

DISTRIBUTION: Fiji and Tonga, and perhaps westward into other Melanesian archipelagoes; one may question Pennington's (1969) comprehensive concept. About 150 Fijian collections from 19 islands have been examined.

LOCAL NAMES AND USES: The usual names in Fiji are *thevua*, *sevua*, and *false sandalwood*; infrequently recorded names are *tarau*, *mariko*, and *wawaro*. Although *thevua* is not an important timber tree, the fragrant wood is sometimes used locally for lining cabinets, etc., and the timbers are used as houseposts and fenceposts.

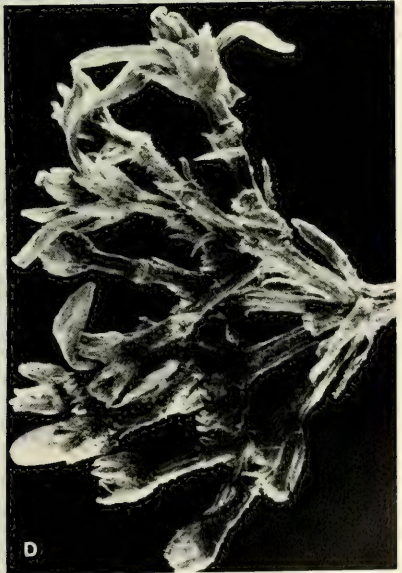
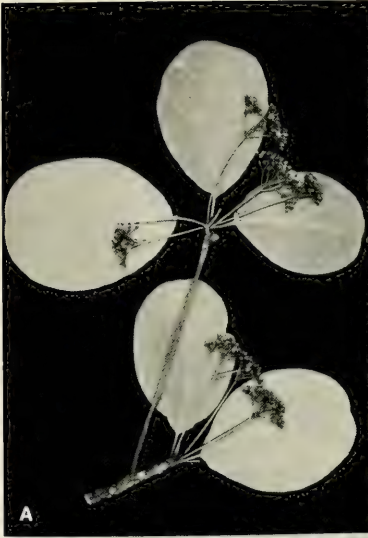
REPRESENTATIVE COLLECTIONS: MAMANUTHAS: NGGALITO Island, Malolo Group, O. & I. *Degener 32243*. VITI LEVU: MBA: Mt. Evans Range, *Greenwood 1254*; Mt. Tomanivi, *Smith 5211*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 13822 (DF 166)*. SERUA: Taunovo River, *Vaughan 3155*. NAMOSI: Vicinity of Wainimakutu, *Smith 8534*. RA: Vicinity of Rakiraki, *DA 13786 (DF 201)*. NAITASIRE: Tholo-i-suva, *DF 562 (Watkins 798)*. TAILEVU: Uthunivanua, *DA 9249 (McKee 2815)*; Naingani Island, *DA 3376*. REWA: Mt. Korombamba, *Gillespie 2344*. VATULELE: Vicinity of Taunovo, *DA 3792*. KANDAVU: Mt. Mbuke Levu, *DA 14915*. OVALAU: Hills west of Lovoni Valley, *Smith 7630*. MAKONDRONGA: *Degener & Ordenez 13807*. KORO: North coast, *Smith 1042*. NAIRAI: *Milne 177*. NGAU: Slopes of Mt. Ndelaito, *Smith 7875*. VANUA LEVU: U. S. Expl. Exped. MBA: Seatovo Range, *Smith 1538*. MATHUATA: Mathuata coast, *Greenwood 647*. THAKAUNDROVE: Maravu, near Salt Lake, *Degener & Ordenez 14195*. MOALA: Summit ridge, *Bryan 347*. MATUKU: *Bryan 251*. VANUA MBALAVU: Namalata Islet, southern limestone section, *Smith 1452*. THIKOMBIA-I-LAU: *Tothill 59c*. LAKEMBA: *Tothill 61*. TAVUNASITHI: Western slope, *Bryan 518*. KAMBARA: *Smith 1278*. FULANGA: *Smith 1225*. ONGEA NDRIKI: *Bryan 395*.

2. *Vavaea harveyi* Seem. Fl. Vit. 35. 1865; C. DC. in DC. Monogr. Phan. 1: 646. 1878; Drake, Ill. Fl. Ins. Mar. Pac. 136. 1890; A. C. Sm. in Contr. U. S. Nat. Herb. 30: 473. 1952; J. W. Parham, Pl. Fiji Isl. 172. 1964, ed. 2. 244. 1972.

FIGURES 119C & D, 120A.

Vavaea amicorum sensu Penn. in Blumea 17: 358, p. p. 1969.

FIGURE 119. A & B, *Vavaea amicorum*; A, distal portion of branchlet, with foliage and inflorescences, $\times 1/4$; B, ultimate cluster of flowers, $\times 4$. C & D, *Vavaea harveyi*; C, distal portion of branchlet, with foliage and inflorescences, $\times 1/4$; D, ultimate cluster of flowers, $\times 4$. A & B from *Smith 1452*, C & D from *DA 16801*.



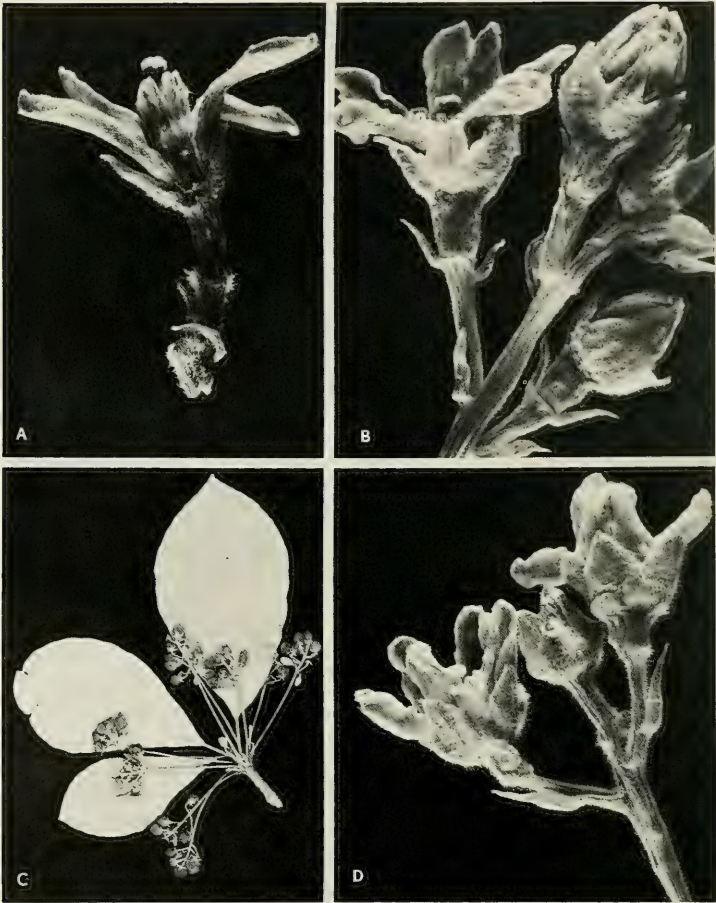


FIGURE 120. A, *Vavaea harveyi*; flower, with 2 calyx lobes and 1 petal removed, $\times 6$. B, *Vavaea megaphylla*; ultimate cluster of flowers, $\times 3$. C & D, *Vavaea degeneri*; C, distal portion of branchlet, with foliage and infructescences, $\times 1/5$; D, ultimate cluster of flowers, $\times 3$. A from DA 16801, B from DA 7262, C from Degener 15188, D from Smith 9515.

Often slender tree 4–18 m. high, found from near sea level to about 825 m. in dense or dry forest or on its edges. The petals and filaments are white to pale yellow, and the fruits are dull yellow to orange or red, becoming black at maturity. Flowers have been noted between November and April, fruits between July and December.

TYPEFICTION: The type is *Harvey* (K HOLOTYPE; ISOTYPE at GH), collected in Fiji without further locality (Seemann stated "probably Vanua Levu," but there is no such indication on the type material).

DISTRIBUTION: Endemic to Fiji and thus far known from the two large islands, Ovalau, and Taveuni; 32 collections have been examined.

LOCAL NAMES AND USE: As for *Vavaea amicorum*, the usual Fijian names are *thevua* and *sevua*; foresters note the species as a timber tree, but it is not extensively cut for that purpose.

REPRESENTATIVE COLLECTIONS: VITI LEVU: NADRONGA & NAVOSA: Rairaimatuku Plateau, between Nandrau and Rewasau, *Smith 5617*. SERUA: Inland from Ngaloa, *DA 16801*. NAMOSI: Vicinity of Saliandrau, Wainikoroiuva River, *DA 14588*; vicinity of Namuamua, *Gillespie 2995*. NAITASIRI: Near Matawai-levu, Wainimala River, *DA 14021*; Tholo-i-suva, *DA 11974*. REWA: Mt. Korombamba, *DA 3836*. OVALAU: Vicinity of Levuka, *Gillespie 4557.5*. VANUA LEVU: MBUA: Lower Wainunu River Valley, *Smith 1755*. MATHUATA: Wainggili, vicinity of Lambasa, *DF 241*. THAKAUNDROVE: Vicinity of Waiwai, Savusavu Bay, *Horne 639*. TAVEUNI: Western slope between Somosomo and Wairiki, *Smith 840*.

Unless one adopts a very broad circumscription of *Vavaea amicorum*, the combination of characters utilized in the above key permits recognition of *V. harveyi*, even though no single character by itself is entirely satisfactory.

3. *Vavaea megaphylla* C. H. Wright in Kew Bull. **1895**: 102. 1895; Oliver in Hook. Icon.

Pl. **25**: pl. 2438. 1896; Gillespie in Bishop Mus. Bull. **83**: 15. fig. 17. 1931; A. C. Sm. in Contr. U. S. Nat. Herb. **30**: 474. 1952; J. W. Parham, Pl. Fiji Isl. **172**. 1964, ed. 2. **244**. 1972; Penn. in *Blumea* **17**: 362, p. p. fig. 1, f. 1969. FIGURE 120B.

Trigonostemon (?) *voratus* Croizat in *Sargentia* **1**: 52. 1942.

An often slender tree 2–12 m. high, occurring from near sea level to about 950 m. in forest, often on ridges or slopes. The fragrant flowers have white or yellowish petals, and the fruit turns from yellowish green to red and doubtless at length to black. Flowers have been obtained from January to May, fruits from March to July.

TYPEFICTION: The type of *Vavaea megaphylla* is *Yeoward 37* (K HOLOTYPE), collected June 6, 1894, in the vicinity of Tamavua, Naitasiri Province, Viti Levu. *Trigonostemon voratus* was based on *Tabualewa 15569* (A HOLOTYPE; ISOTYPES at BISH, K, US), collected June 17, 1941, at Mbuyombuyo, near Namboutini, Serua Province, Viti Levu; flowers and fruits of the *Tabualewa* collection had been so insect-damaged that its family was not originally recognized. *Trigonostemon* (Euphorbiaceae) does not occur as far east as Fiji.

DISTRIBUTION: Endemic to Fiji, known from the two largest islands and Rambi; 23 collections have been studied.

LOCAL NAMES: In addition to the generic names *thevua* and *sevua*, the name *navua* has been recorded (*Degener 15265*).

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, *Tothill 59a*. NADRONGA & NAVOSA: Yawe, vicinity of Mbalo, near Vatukarasa, *Degener 15265*; north of Komave, *St. John 18962*. SERUA: Inland from Namboutini, *DA 14258*. NAITASIRI: Central road, *Tothill 190*; Wainimbuku Creek, near Nasinu, *DA 7262*. TAILEVU: Nggelendamu, *DA 8721*. VANUA LEVU: MBUA: Mt. Seatura, *DA 14897*. THAKAUNDROVE: Vicinity of Savusavu, *Bierhorst F207*; track to Natewa, *DA 15079*. RAMBI: *Horne 477*.

4. *Vavaea degeneri* A. C. Sm. in Contr. U. S. Nat. Herb. **30**: 475. 1952; J. W. Parham, Pl. Fiji Isl. **172**. 1964, ed. 2. **244**. 1972. FIGURES 120C & D, 121.

Vavaea megaphylla sensu Penn. in *Blumea* **17**: 362, p. p. 1969.

A coarsely branched tree or simple-stemmed shrub 4–6 m. high, occurring in open or dry forest at elevations of 50–150 m. The fragrant flowers have the petals white and yellow-tinged, fading to yellow; the anthers and stigma are pale yellow; and the fruits

are red, doubtless becoming black at maturity. Flowers have been obtained between November and April, fruits only in April and May.

TYPIFICATION: The species is based on *Degener & Ordonez 14099* (us 1943578 HOLOTYPE; ISOTYPES at A, BISH, K), collected Jan. 12, 1941, east of Naunduna, eastern drainage of Yanawai River, Thakaundrove Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and known only from limited areas near the southern coasts of both large islands.

LOCAL NAME: The only name noted is *mbuanivinggalau* (*Degener 15098*).

AVAILABLE COLLECTIONS: VITI LEVU: SERUA: Thulanuku, vicinity of Ngaloa, *Degener 15098*; Vatuvathe, vicinity of Ngaloa, *Degener 15188*; hills between Wainiggere and Waisee Creeks, between Ngaloa and Wainiyambia, *Smith 9361, 9515*.

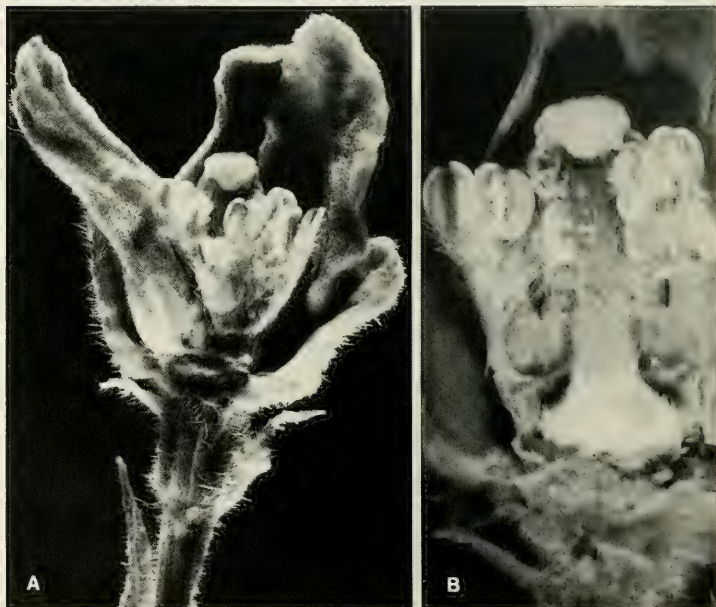


FIGURE 121. *Vavaea degeneri*, from *Smith 9515*; A, flower, with 2 calyx lobes and 2 petals removed, $\times 8$; B, gynoecium and portion of staminal tube, showing disk confluent with base of tube, $\times 15$.

4. *AGLAIA* Lour. Fl. Cochinch. 173. 1790; Seem. Fl. Vit. 37. 1865; C. DC. in DC. Monogr. Phan. 1: 600. 1878; Harms in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19b1: 140. 1940; A. C. Sm. in Contr. U. S. Nat. Herb. 30:476. 1952; Penn. & Styles in Blumea 22: 481. 1975. Nom. cons.

Trees or shrubs, sometimes functionally dioecious, the indument lepidote or stellate; leaves imparipinnate, with opposite or alternate leaflets, sometimes trifolio-

late or unifoliolate, the leaflet blades entire; inflorescences axillary (infrequently on branches or stems), paniculate, the flowers appearing ♂ but perhaps usually functionally unisexual, then the ♂ inflorescences inclined to be larger than the ♀, the latter often with the fewer and larger flowers; calyx shallowly or deeply (2-)4- or 5-lobed, the lobes usually imbricate, glabrous within; petals usually 5 (3-6), free or basally connate, imbricate, rarely proximally adnate to filament tube; filament tube short-cylindric to urceolate or subglobose, apically entire to dentate, the anthers usually 5-10 (3-19) (mostly 5 in our species), borne in a single series on margin of filament tube or included within it, in ♀ flowers without pollen, the tube often carnos; disk inconspicuous or lacking; ovary 1-3(-5)-locular, the ovules 1 or 2 per locule, if 2 collateral or superposed (small or lacking in ♂ flowers), the style short or essentially none, the stigma often large, capitate to clavate, sometimes with 2-4 small lobes; fruits baccate, sometimes succulent, infrequently a nut or a loculicidal capsule, the seeds 1-4 (-5), each with an arillode or infrequently with a sarcotesta.

TYPE SPECIES: *Aglaiia odorata* Lour.

DISTRIBUTION: Tropical Asia from India and Ceylon throughout Malaysia to northern Australia and eastward to Micronesia, Tonga, Niue, and Samoa, with about 300 species (about 100 species according to Pennington and Styles, 1975). Fourteen indigenous species represent the genus in Fiji.

LOCAL NAMES: Names commonly used for any species of the genus on Viti Levu are *lindiyango* and *nggiliyango*, while in the Lau and Loma-i-Viti Groups the name *langakali* is more or less generic in nature. However, these and other names are recorded below for individual species when appropriate.

The attractive small flowers of *Aglaiia* have the calyx and often the petals pilose with the type of trichome characteristic of the species. The calyx is pale brown to cinnamon-brown; the petals are usually brownish without and paler within, from white to yellowish, greenish, or orange; the filament tube is often yellow, and the anthers may be white to yellowish or pale brown. Flowers of most species have a pleasant fragrance. Fruits are at first yellowish to bright orange or reddish, becoming brown at full maturity.

Of the three sections of *Aglaiia* discussed by Harms (1940), the Fijian species fall into either sect. *Aglaiia* ("Euaglaiia"), with anthers included within the staminal tube, or sect. *Hearnia*, with anthers borne on the margin of the staminal tube. This character is usually clear, but often the anthers of sect. *Aglaiia*, although borne within the filament tube, project beyond it (FIGURE 126A & B), and sometimes the anthers of sect. *Hearnia*, when dorsifixed near their bases on deltoid projections of the filament tube, appear to have bases within the tube (FIGURE 127C & D). A more obvious grouping of our species is suggested by the type of indument, which is either (1) lepidote, with trichome rays adnate into scales except at apices (FIGURE 122A & B), (2) stellate, with trichome rays free nearly to base and uniform in length (FIGURE 122C & D), or (3) stellate, with trichome rays diverse in length, some of them stiffer and longer than others (FIGURE 122E-G). A third means of grouping species is suggested by the fact that two Fijian species have unifoliolate leaves, some have leaves with the terminal leaflet much larger than the lateral leaflets, and the balance have leaves with the terminal and lateral leaflets approximately the same size. These variation patterns do not coincide, and a natural classification of the species of *Aglaiia* must await detailed study of the entire genus. Trichome type seems to offer the most dependable means of dividing our species into readily recognizable clusters.

KEY TO SPECIES

- Indument of lower surface of leaflet costa (and also of branchlets, inflorescences, etc.) lepidote, the trichomes with rays adnate into a membranaceous scale and free only at apices.
- Leaves unifoliolate (or rarely with 1 or 2 small, lateral leaflets), obviously petiolate, the blades oblanceolate- or oblong-elliptic, rounded or obtuse at base. 1. *A. haplophylla*
- Leaves pinnate, the leaflets (3-) 5-13, subequal or the terminal one only slightly larger than the lateral ones.
- Anthers included within filament tube distally; petals 2-3.5 mm. long, lepidote without (except at imbricate margins and apex); filament tube about 2 mm. long; inflorescences compact, rarely more than 3 cm. long. 2. *A. axillaris*
- Anthers marginal on filament tube, not included within it.
- Petals 2-3.5 mm. long, copiously lepidote without except at margins; filament tube about 1 mm. long; inflorescences usually ample, often 10-15 cm. long; leaflet blades oblong or elliptic, usually gradually narrowed toward apex. 3. *A. vitiensis*
- Petals not more than 1.5 mm. long, glabrous; filament tube about 0.5 mm. long; inflorescences compact, 1-2 cm. long at anthesis; leaflet blades lanceolate-oblong, not appreciably narrowed toward apex. 4. *A. gracilis*
- Indument of lower surface of leaflet costa (etc.) composed of stellate trichomes with rays free nearly to base (or at least in the distal half) and not adnate into a membranaceous scale.
- Rays of trichomes small and fairly uniform in length, the stellate hairs rarely more than 0.3 mm. in diameter (rays 0.15 mm. or less in length).
- Leaves unifoliolate or, if pinnate, with the terminal leaflet greatly exceeding in size the 2 or 4 lateral leaflets, the lower pair of these arising from base of rachis, simulating stipules.
- Leaves strictly unifoliolate, the leaflet blades essentially sessile, cordate-amplexicaul; anthers marginal on filament tube. 5. *A. amplexicaulis*
- Leaves with greatly reduced lateral leaflets, the terminal leaflet obviously petiolulate, the blade obtuse at base (mature flowers not yet known). 6. *A. evansensis*
- Leaves pinnate, with 5-9 leaflets, the lateral leaflets not greatly smaller than the terminal one, the lowest pair not basal.
- Leaflets comparatively large, the terminal one with a blade usually 10-20 cm. long; anthers inserted within filament tube. 7. *A. saltatorum*
- Leaflets comparatively small, the terminal one with a blade usually less than 10 cm. long; anthers marginal on filament tube (but flowers not yet known for no. 8).
- Inflorescences 2-8 cm. long (including fruits); leaflets 5 or 7, the blades lanceolate- or elliptic-oblong, 5-12 × 2.5-5 cm. (lowermost ones sometimes slightly smaller) (flowers not yet known). 8. *A. elegans*
- Inflorescences 2-4 cm. long (including fruits); leaflets 7 or 9, the blades lanceolate-oblong, 4-7 × 1.2-2 cm.; anthers marginal on filament tube. 9. *A. venusta*
- Rays of trichomes (at least those of leaflet blade costas, young branchlets, and young leaflet blade surfaces, and usually those of inflorescences as well) diverse in length, with some rays 0.2-1 mm. or more in length; anthers marginal on filament tube (but flowers not yet known for no. 10).
- Leaves comparatively small, the leaflet blades 5-15 × 1.8-5.5 cm.; fruits ellipsoid, at maturity apparently not exceeding 2.5 cm. in length.
- Lowermost pair of leaflets attached at or toward base of leaf, often simulating stipules, the petiole below these leaflets (or obvious scars of them) less than 1 cm. long. 10. *A. basiophylla*
- Lowermost pair of leaflets not basal on leaf, the petiole usually more than 2 cm. long.
- Indument of lower surfaces of leaflet blades (except on costa) fugacious; lateral leaflets usually 3 or 4 (but rarely 1-5) pairs, not conspicuously smaller than the terminal one, the petiolules of lateral leaflets 5-15 mm. long. 11. *A. greenwoodii*
- Indument of lower surfaces of leaflet blades persistent; lateral leaflets 1 or 2 pairs, conspicuously smaller than the terminal one (leaves very rarely unifoliolate), the petiolules of lateral leaflets 2-3 mm. long. 12. *A. fragilis*
- Leaves comparatively large, the leaflet blades usually 10-35 × 5-14 cm.; fruits ellipsoid or subglobose, often to 4 cm. in length.
- Lateral leaflets 2 or 3 (rarely 4) pairs, the blades obtuse at base (or lowermost ones rounded), cuspidate or short-acuminate at apex, the indument persisting on lower surface; hairs of calyx with numerous rays 1 mm. or more in length among shorter rays; petals glabrous; fruits ellipsoid-subglobose, 2-4 cm. in diameter. 13. *A. archboldiana*
- Lateral leaflets 4 or 5 (rarely 3) pairs, the blades obtuse to rounded or subcordate at base, obtuse at apex, the indument persistent only on costa beneath; hairs of calyx uniformly small, the rays only occasionally as long as 0.5 mm.; petals pilose on exposed surfaces; fruits oblong-ellipsoid, up to 4 × 1.5 cm. 14. *A. parksii*

1. *Aglaia haplophylla* A. C. Sm. in Contr. U. S. Nat. Herb. 30: 496. 1952; J. W. Parham, Pl. Fiji Isl. 169. 1964, ed. 2. 240. 1972. FIGURE 122A.

Small tree about 7 m. high, occurring in dense ridge forest at an elevation of 1,050–1,120 m., the young parts copiously lepidote, the scales persisting on some foliage parts and on infructescence. The leaves are unifoliolate (or with 1 or 2 small, inconspicuous, lateral leaflets), with obvious petioles 0.7–2 cm. long and with leaflet blades oblanceolate- or oblong-elliptic, 6–11 × 2–4 cm., and rounded or broadly obtuse at apex. Inflorescences are not available, but infructescences are 2–3 cm. long including young fruits and are copiously lepidote throughout; the fruiting calyx is 3–4 mm. long and in diameter, with oblong lobes 0.8–1 mm. long; and immature fruits are ellipsoid, up to 12 × 6 mm.

TIPIFICATION: The type is *Smith 5683* (A HOLOTYPE; ISOTYPES at BISH, K, US), collected Aug. 18, 1947, on ridge between Mt. Nanggaranambuluta and Mt. Namama, east of Nandarivatu, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and known only from the type collection.

Although the lepidote indument of this apparently rare species indicates its relationship to the following three species, its unifoliolate leaves at once distinguish it.

2. *Aglaia axillaris* A. C. Sm. in Sargentia 1: 43. 1942, in Contr. U. S. Nat. Herb. 30: 481. 1952; J. W. Parham, Pl. Fiji Isl. 169. 1964, ed. 2. 240. 1972. FIGURE 123E.

An often slender tree 2–20 m. high, with a trunk to 30 cm. in diameter (or rarely noted as a shrub 1–2 m. high), found at elevations of 50–1,050 m. in dense or dark forest or in the forest of crests and ridges, with often persistent ferruginous scales on foliage parts and inflorescences. The pinnate leaves have petioles 4–14 cm. long, 5–13 leaflets with petiolules 4–14 (–22) mm. long and oblong to elliptic- or ovate-oblong blades (7–) 10–18 (–28) × 3.5–9 (–13) cm., obtuse at base, and obtuse or bluntly cuspidate at apex. The inflorescences are compact, 1–3 (in a single collection to 20) cm. long at anthesis, with subsessile flowers; the calyx lobes are about 1.2 mm. long and broad, the petals 2–3.5 × 1.5–2 mm. and lepidote without like calyx, and the filament tube is about 2 mm. long, with anthers 0.8–1 mm. long included within it distally. The fruits are oblong- to globose-ellipsoid, closely ferruginous-lepidote, and at maturity up to 4 × 2.5 cm. Flowers have been noted between December and August, fruits throughout the year.

TIPIFICATION: The type is *Degener 14505* (A HOLOTYPE; ISOTYPES at BISH, K, NY, US), collected Feb. 18, 1941, on Mt. Matomba, Nandala, south of Nandarivatu, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known from four of the high islands; 45 collections have been studied.

LOCAL NAMES: The usual names in central Viti Levu are *lindiyango* and *nggi-liyango*; *sasawira* and *ndawandawa* have also been recorded in Mba Province. The wood is noted as fragrant, but the species is apparently not cut commercially.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 1204*; on escarpment north of Nandarivatu, *Gillespie 3757*; Mt. Tomanivi, *DA 13028*. NANDRONGA & NAVOSA: Northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, *Smith 5611*. SERUA: Hills east of Navua River, near Nukusere, *Smith 9104*. NAMOSI: Mt. Naitarandamu, *Gillespie 3105*. NAITASIRI: Mendrausuthu Range, *DA 15486*; Central road, *MacDaniels 1144*; near Tamavua Village, *Gillespie 2430* (inflorescence abnormally elongated). OVALAU: Near summit of ridge west of Levuka, *Gillespie 4451*. VANUA LEVU: MBUA: Singasingau Creek, headwaters of Ndama River above Ndriti, *DA 15189*. THAKAUNDROVE: Mt. Mbatini, *Smith 645*. TAVEUNI: Mountains east of Somosomo, *DA 15896*; slopes of Mt. Manuka, east of Wairiki, *Smith 8141*. FIJI without further locality, U. S. Expl. Exped. (us 15570, 15574).

The three Fijian *Aglaiae* with lepidote indument and compound leaves are not readily separable without flowers; of the three, *A. axillaris* alone falls into sect. *Aglaia*,

and only *A. gracilis* has glabrous petals. But species of *Aglaia* seem more commonly collected in fruiting condition. The three species, in the absence of flowers, may be distinguished as follows:

Leaflets (5-) 7 or 9, the blades comparatively long and narrow, 7-28 × 2-7 cm., lanceolate-oblong, not appreciably narrowed toward the rounded or broadly obtuse apex; fruiting inflorescences compact, scarcely 3 cm. long, the fruits at maturity up to 3 × 1.5 cm. *A. gracilis*

Leaflets (3-) 5-13, the blades proportionately broader, usually (4-) 10-20 × (2-) 3.5-9 cm., oblong to elliptic or ovate-oblong, more obviously tapering toward the obtuse or rounded or bluntly cuspidate apex; fruits at maturity 2-4 cm. long.

Fruiting inflorescences compact, often with only 2 or 3 fruits on a short peduncle, rarely as much as 10 cm. long and with 4 or 5 fruits. *A. axillaris*

Fruiting inflorescences more extended, often 15 cm. or more long and with many fruits. *A. vitiensis*

Aglaia axillaris, with anthers included within the filament tube (sect. *Aglaia*), is actually not as closely related to the two mentioned Fijian species as it is to *A. samoensis* A. Gray (endemic to Samoa) and *A. heterotricha* A. C. Sm., of Tonga. Relationships among these lepidote species of sect. *Aglaia* were discussed in my 1952 review.

3. *Aglaia vitiensis* A. C. Sm. in Bishop Mus. Bull. 141: 80. fig. 41. 1936, in Contr. U. S. Nat. Herb. 30: 487. 1952.

A compact or slender, sometimes freely branched tree 3-23 m. high, with a trunk to 30 cm. in diameter, occurring in forested areas, with the young parts lepidote and the scales persisting at least on the lower surfaces of leaflet costas and inflorescence parts. Petioles of the pinnate leaves are up to 17 cm. long and the leaflets are (3-) 5-9, with oblong or elliptic blades up to 21 × 13 cm. and obtuse or rounded at apex. The inflorescences are freely branched, up to 15 cm. long at anthesis; the pedicels are up to 2 mm. long, the calyx lobes broadly ovate, up to 0.7 × 1.5 mm., and the petals are 2-3.5 mm. long and copiously lepidote on exposed outer surfaces; the filament tube is about 1 mm. long, and the anthers are marginally borne and about 1 mm. long. The persistently lepidote fruits are subglobose to ellipsoid or obovoid, 2-4 cm. long. On the basis of foliage differences two varieties are recognized.

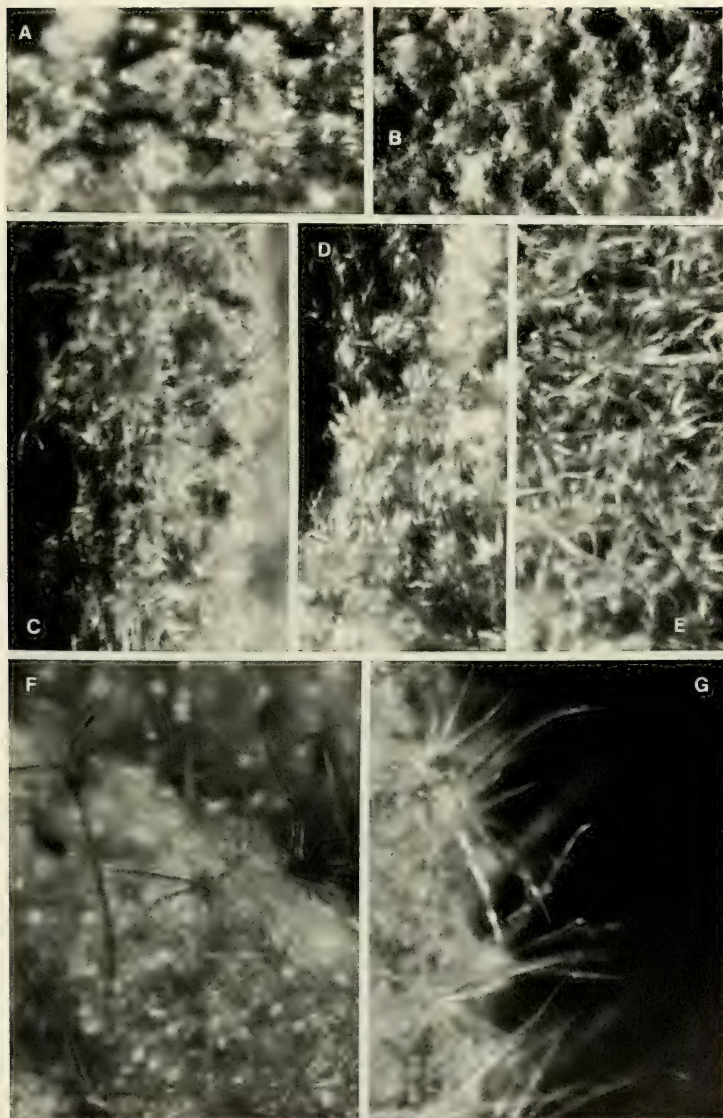
In the original description of *Aglaia vitiensis* I cited five collections, but all of these except the type are now referred to *A. axillaris*. Again, in 1942 (in *Sargentia* 1: 42), I listed five other collections as representing *A. vitiensis*, but only one (*Degener 14666*) was correctly placed there, three of the others (*Gillespie 3757, 3105, and Degener 14334*) now being referred to *A. axillaris*, the fifth (*Gillespie 4316*) to *A. gracilis*. Obviously the lepidote Fijian *Aglaiae* with pinnate leaves were not understood by me prior to 1952; floral differences among them are striking, but without flowers they present difficulties.

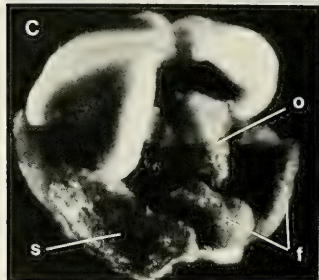
KEY TO VARIETIES

Leaves up to 45 cm. long, the lateral leaflet blades (except for lowermost) 10-20 × 4.5-7.5 cm., with 12-15 secondary nerves per side, the terminal leaflet blade similar or larger, up to 21 × 13 cm., with 12-17 secondary nerves per side. 3a. var. *vitiensis*

Leaves less than 30 cm. long, the lateral leaflet blades (3-) 4-10.5 × (1.2-) 2-4.5 cm., with 6-12 secondary nerves per side, the terminal leaflet blade essentially similar. 3b. var. *minor*

FIGURE 122. *Aglaia*, trichomes. A, *A. haplophylla*; trichomes on lower surface of costa of leaflet blade. B, *A. vitiensis* var. *vitiensis*; trichomes on lower surface of young leaflet blade. C, *A. evansensis*; trichomes on lower surface of costa of leaflet blade. D, *A. saltatorum*; trichomes on inflorescence branches. E, *A. greenwoodii*; trichomes on lower surface of young leaflet blade. F, *A. fragilis*; trichomes on lower surface of leaflet blade. G, *A. archboldiana*; trichomes on lower surface of leaflet blade. A from *Smith 5683*, B from *Smith 7042*, C from *Greenwood 1072*, D from *Smith 1476*, E from *Smith 7531*, F from *Degener 14680*, G from *DA 17214*. All × 70.





3a. *Aglaia vitiensis* var. *vitiensis*; A. C. Sm. in Contr. U. S. Nat. Herb. 30:487. 1952; J. W. Parham, Pl. Fiji Isl. 169. 1964, ed. 2. 241. 1972. FIGURES 122B, 123A-D.

The type-including variety, with comparatively large leaves and with the terminal leaflet sometimes larger than the lateral leaflets, occurring in usually dense forest at elevations of 50-750 m. Flowers have been obtained between November and May, fruits only in June and December.

TYPIFICATION: The type is *Smith 981* (BISH HOLOTYPE; many ISOTYPES), collected Jan. 29, 1934, on the eastern slope of the main ridge of Koro.

DISTRIBUTION: Endemic to Fiji and now known from four of the high islands, represented by 21 collections.

LOCAL NAMES AND USES: Recorded local names are *mala* (Mba, Serua), *kaunithina* (Namosi, Serua); name usually refers to Burseraceae), *thawaru* (Tailevu), and *langakali* (Ngau). In Serua the species is sometimes cut as a timber tree, and in Tailevu I was told that the bark is used medicinally.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Sovutawambu, near Nandarivatu, *Degener 14666*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 13348*. SERUA: Inland from Namboutini, *DF 523*; hills west of Waivunu Creek, between Ngaloa and Korovou, *Smith 9222*. NAMOSI: Naraiyawa, on Wainikoroiluva River, *DA L.13333* (*Berry 82*); hills east of Navua River, *Greenwood 989*. NAITASIRI: Central road, *Tothill 518*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7042*. NGAU: Hills east of Herald Bay, inland from Sawaieke, *Smith 7762*. TAVEUNI: Above Nggathavulo Estate, *DA 16936*.

3b. *Aglaia vitiensis* var. *minor* A. C. Sm. in Contr. U. S. Nat. Herb. 30:488. 1952; J. W. Parham, Pl. Fiji Isl. 169. 1964, ed. 2. 241. 1972.

A variety with basic characters similar to the typical variety but differing in its smaller leaves and leaflets, the terminal leaflet blade being essentially equal in size to the upper lateral ones, occurring in dense forest or in the dense thickets of crests and ridges at elevations from near sea level to 1,200 m. Flowers have been collected between January and August, fruits between May and January.

TYPIFICATION: The type is *Smith 1788* (US 1674996 HOLOTYPE; many ISOTYPES), collected May 10, 1934, on Mt. Kasi, Yanawai River region, Thakaundrove Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and recorded from six islands; 35 collections have been examined. The smaller-leaved variety of *Aglaia vitiensis* seems more frequently collected and apparently more widespread within the archipelago than the typical variety.

LOCAL NAMES AND USE: In addition to the names *lindiyango* and *nggiliyango* used in central Viti Levu, recorded names have been *mboimboi* (Waya), *mbaumbulu* (Mba), and *tawatawa* (Serua); on Waya a medicinal use was imputed to the plant.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Nangua, *St. John 18165*. VITI LEVU: MBA: Mt. Evans Range, *Greenwood 1257*; western and southern slopes of Mt. Tomanivi, *Smith 5096*. NANDRONGA & NAVOSA: Nausori Highlands, *DF 215* (*Watkins 780*); northern portion of Rairaimatuku Plateau, between Nandrau and Nanga, *Smith 5556*. SERUA: Inland from Yarawa, *DA L.25951* (*DF 156*). SERUA or NAMOSI: Between Waionamoli and Veinungga Creeks, *Horne 858*. NAMOSI: Mt. Naitarandamu, *Gillespie 3348*; near summit of Mt. Voma, *Gillespie 2784*. RA: Ridge from Mt. Namama (east of Nandarivatu) toward Mt. Tomanivi, *Smith 5726*. NAITASIRI: Central road, *Tothill 519b*. REWA: Mt. Korombamba, *DA 16534*. KANDAVU: Slope of Mt. Mbuke Levu, *DA 14917*. OVALAU: In mountains, *Horne 344*; summit of Mt.

FIGURE 123. A-D, *Aglaia vitiensis* var. *vitiensis*; A, ultimate cluster of functionally ♀ flowers, × 4; B, flower, × 20; C, androecium and gynoecium of functionally ♀ flower, showing filament tube (f) with 3 marginally borne anthers remaining, ovary (o) and sessile stigma, and a remaining sepal (s), × 30; D, distal portion of branchlet, with a leaf and inflorescences of functionally ♀ flowers, × 1/4. E, *Aglaia axillaris*: infructescences, and a seed with arillode, × 1. A-C from *Smith 7042*, D from *DA 13348*, E from *Gillespie 3757* (seed from *Smith 9104*).

Tana Lailai and adjacent ridge, *Smith 7713*. VANUA LEVU: MATHUATA: Mt. Ndelaikoro, *DA 12806*. THAKAUNDROVE: East of Naunduna, eastern drainage of Yanawai River, *Degener & Ordenez 14084*; eastern slope of Mt. Ndikeya, *Smith 1900*. MOALA: Near Maloku, *Smith 1337*.

4. *Aglaia gracilis* A. C. Sm. in *Contr. U. S. Nat. Herb.* **30**: 489. 1952; J. W. Parham, *Pl. Fiji Isl.* **169**. 1964, ed. 2. 240. 1972; A. C. Sm. in *Contr. U. S. Nat. Herb.* **37**: 72. 1967. FIGURE 124.

Dysoxylum obliquum Gillespie in *Bishop Mus. Bull.* **83**: 13, p. p. *fig. 15* (excl. *a-e*). 1931; non *Aglaia obliqua* White & Francis (1927).

Didymocheton obliquum Harms in *Engl. & Prantl, Nat. Pflanzenfam.* ed. 2. **19b1**: 157. 1940.

Slender tree or simple-stemmed shrub 2-5 m. high, found at elevations of 50-1,200 m. in dense or dry forest. The indument of young parts is lepidote and sparsely persistent on foliage parts; the pinnate leaves are as much as 70 cm. long, with a petiole 3-22 cm. long and (5-) 7 or 9 leaflets, these with petiolules 2-10 mm. long and lanceolate-oblong blades 7-28 × 2-7 cm. and rounded or broadly obtuse at apex. The compact inflorescences, 1-2 cm. long at anthesis, are comparatively few-flowered and are borne on the stem or on branchlets below leaves; the calyx lobes are 0.6-0.8 mm. long, the glabrous petals 1.3-1.5 × 1-1.8 mm., and the filament tube is about 0.5 mm. long, with anthers about 0.7 mm. long borne marginally. Fruiting inflorescences are compact, the fruits being ovoid-ellipsoid, persistently lepidote, and at maturity up to 3 × 1.5 cm. Flowers have been obtained in October and November, fruits in December and between June and August.

TYPIFICATION AND NOMENCLATURE: The type is *Smith 6325* (A HOLOTYPE; ISOTYPES at BISH, K, US), collected Oct. 2, 1947, on the western slope of Mt. Nanggaranambuluta, east of Nandarivatu, Mba Province, Viti Levu. *Dysoxylum obliquum* is typified by *Gillespie 4316* (BISH HOLOTYPE; ISOTYPE at GH), obtained Dec. 14, 1927, in the vicinity of Nandarivatu. Gillespie's taxon is based on a confused concept, all the cited specimens belonging to either *Aglaia gracilis* (*Gillespie 3951, 4161, 4316*) or *A. axillaris* (*Gillespie 3757, 4451, 4682*). However, the inflorescences and flowers were described from *Horne 316*, of which the flowers were figured in Gillespie's *fig. 15, a-e*. (*Horne 316* in the same paper, p. 13, was correctly referred to *Dysoxylum lenticellare* by Gillespie.) The habit sketch of *fig. 15* and the seed (*f, g*) seem to have been drawn from *Gillespie 4316*. Only Gillespie's type (no. 4316) is concerned in the nomenclature; in 1952 I tentatively referred it to *A. gracilis*, but subsequent study removes doubt as to its identity. However, the epithet *obliquum* is not available in *Aglaia*.

DISTRIBUTION: Endemic to Fiji and thus far known only from Viti Levu.

LOCAL NAME: *Lindiyango*.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Summit of Mt. Koroyanitu, high point of Mt. Evans Range, *Smith 4203*; vicinity of Nandarivatu, *Gillespie 3951, 4161*; ridge between Mt. Nanggaranambuluta and Mt. Namama, *Smith 4991*; Nauwanga, south of Nandarivatu, *Degener 14689*. SERUA: Hills east of Navua River, near Nukusere, *Smith 9126*; hills between Wainingere and Waiese Creeks, between Ngaloa and Wainiyambia, *Smith 9551*. NAITASIRI: Waimanu River, *DA 15585, 15846*.

5. *Aglaia amplexicaulis* A. C. Sm. in *Bishop Mus. Bull.* **141**: 78, *fig. 39*. 1936, in *Contr. U. S. Nat. Herb.* **30**: 491. 1952; J. W. Parham, *Pl. Fiji Isl.* **168**. 1964, ed. 2. 239. 1972. FIGURE 125A.

Tree or shrub 1-10 m. high, occurring at elevations of 200-600 m. in usually dense forest, the indument of young parts composed of stellate hairs 0.1-0.2 mm. in diameter with 10-20 rays free at least in the distal half, the hairs sparingly persistent on some foliage parts and on inflorescences. The unifoliolate, essentially sessile leaves have oblong blades 9-25 × 2-7 cm., cordate-amplexicaul at base, acute at apex. The inflorescences are axillary, 4-5 cm. long at anthesis, few-branched, few-flowered; pedicels 2-3.5 mm. long; calyx lobes 0.8-1 mm. long; petals 2-2.2 × about 1.5 mm.,

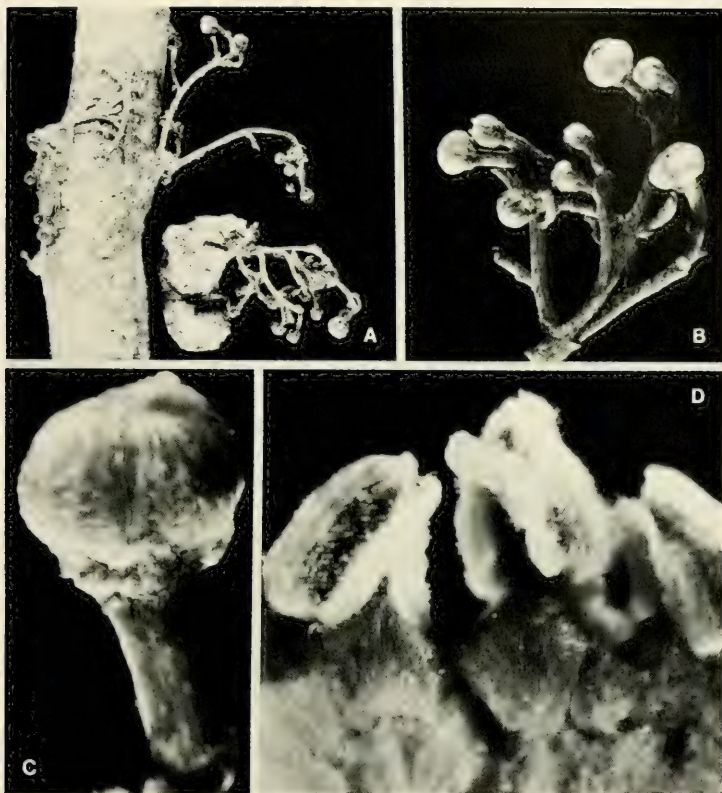


FIGURE 124. *Aglaia gracilis*, from *Smith 9126*; A, inflorescences on branchlet below leaves, $\times 2$; B, ultimate cluster of functionally σ flowers, $\times 4$; C, flower, $\times 20$; D, inner surface of staminal tube with 3 anthers, $\times 50$.

sparsely stellate-pilose proximally without; filament tube about 1 mm. long, with marginal anthers about 1 mm. long. Fruiting inflorescences may be as much as 7 cm. long, with ellipsoid fruits 2×1 cm. or perhaps larger and sparsely stellate-pilose at apparent maturity. Flowers have been collected between March and July, fruits only in October and March.

TYPIFICATION: The type is *Smith 156* (BISH HOLOTYPE; many ISOTYPES), collected Oct. 16, 1933, in hills above Namalata and Ngaloa Bays, Kandavu.

DISTRIBUTION: Endemic to Fiji and, except for the type from Kandavu, known only from western Viti Levu.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Nausori Highlands, *DA 11711, 11730, 12667* (*Melville et al. 7043*), *13884*; southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, *Smith 4718*.

Aglaia amplexicaulis, with unifoliolate leaves and cordate-amplexicaul leaflet blades, has no close relatives in the Fijian Region. The only other species of the area with unifoliolate leaves, *A. haplophylla*, has a lepidote indument and very different foliage.

6. *Aglaia evansensis* A. C. Sm. in Contr. U. S. Nat. Herb. **30**: 497. 1952; J. W. Parham, Pl. Fiji Isl. 169. 1964, ed. 2. 240. 1972. FIGURE 122C.

Slender shrub or tree 2–8 m. high, apparently very local in dense, low forest at an elevation of 900–1,180 m. The indument of young parts is composed of stellate hairs 0.1–0.2 mm. in diameter, with 12–20 rays free nearly to base, persistent on some foliage parts, inflorescences, and infructescences. The leaves, 7–17 cm. long, are 3- or 5-foliolate (sometimes appearing unifoliolate due to loss of small basal leaflets); the petiole is essentially none, the 2 or 4 lateral leaflets are much reduced, the lowermost ones being suborbicular and simulating stipules, and the terminal leaflet has an oblong- or lanceolate-elliptic blade 4–12 × 2–5 cm., obtuse at apex. The inflorescences (only very immature ones seen) are few-flowered; the calyx lobes are 0.7–1 mm. long; and the petals are apparently glabrous. Infructescences are up to 3.5 cm. in length including the few fruits, these being ellipsoid and up to 2 × 1.5 cm. Immature flowers were obtained in May, fruits in April and May.

TIPIFICATION: The type is *Smith 4152* (A HOLOTYPE; ISOTYPES at BISH, K, US), collected May 1, 1947, on the eastern slope of Mt. Koroyanitu, Mt. Evans Range, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and known only from the isolated Mt. Evans Range in northwestern Viti Levu.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mt. Evans Range, upper western slope near summit of Mt. Mbotilamu, *Greenwood 117, 1068, 1072*; slopes of Mt. Nairosa, eastern flank of Mt. Evans Range, *Smith 4080*.

The closest relatives of *Aglaia evansensis* are probably *A. elegans* and *A. venusta*, which it resembles in indument, although in foliage it is more suggestive of *A. basiphylla*, a species with very different indument.

7. *Aglaia saltatorum* A. C. Sm. in Contr. U. S. Nat. Herb. **30**: 483. 1952; Yuncker in Bishop Mus. Bull. **220**: 158. 1959; J. W. Parham, Pl. Fiji Isl. 169. 1964, ed. 2. 240. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 118. 1970; St. John & A. C. Sm. in Pacific Sci. **25**: 331. 1971. FIGURES 122D, 125B–D, 126A & B.

Aglaia edulis sensu A. Gray, Bot. U. S. Expl. Exped. **1**: 237, p. p., non sensu typi. 1854; Seem. in Bonplandia **9**: 254. 1861, Viti, 434. 1862, Fl. Vit. **37**, p. p. 1865; C. DC. in DC. Monogr. Phan. **1**: 609, p. p. 1878; Drake, Ill. Fl. Ins. Mar. Pac. **137**, p. p. 1890.

Aglaia sp. Burkill in J. Linn. Soc. Bot. **35**: 31. 1901.

Aglaia samoensis sensu A. C. Sm. in Bishop Mus. Bull. **141**: 80, fig. 41, b. 1936; Yuncker in op. cit. **178**: 71. 1943; non A. Gray.

Shrub or slender tree 2–10 m. high, found near sea level or up to 70 m. elevation in forest or thickets, usually on limestone, with the indument of young parts stellate, the hairs 0.1–0.2 mm. in diameter, composed of 13–20 rays free at least in the distal half and becoming sparse on older parts. The leaves are 5–9-foliolate, the petiole 6–18 cm. long, the petiolules 5–20 mm. long, the leaflet blades elliptic or oblong-elliptic, (8–) 10–20 (–26) × (3.5–) 4–10 (–12) cm., rounded to inconspicuously cuspidate at apex, the lowermost ones somewhat reduced in size. The usually ample inflorescences are paniculate, freely branching, many-flowered, usually 20–40 cm. long (rarely as short as 3 cm.); calyx lobes 0.5–0.7 mm. long; petals 1.3–2 × 1–1.3 mm., stellate-pilose without

FIGURE 125. A, *Aglaia amplexicaulis*; distal portion of branchlet, with foliage and inflorescences, × 1/2. B–D, *Aglaia saltatorum*; B, distal portion of branchlet, with foliage and an inflorescence, × 1/4; C, part of inflorescence with functionally ♂ flowers, × 4; D, flower, × 20. A from *DA 13884*, B–D from *Smith 1240*.



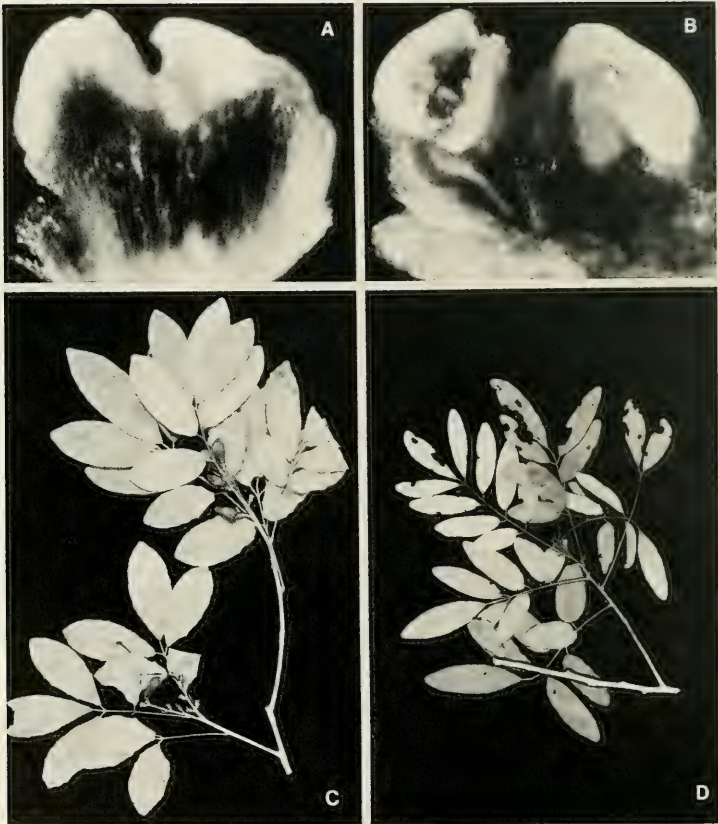


FIGURE 126. A & B, *Aglaia saltatorum*; A, outer surface of staminal tube with 2 anthers, $\times 50$; B, inner surface of staminal tube with 2 anthers, $\times 50$. C, *Aglaia elegans*; distal portion of branchlet, with foliage and infructescences, $\times 1/4$. D, *Aglaia venusta*; distal portion of branchlet, with foliage and inflorescences, $\times 1/4$. A & B from *Smith 1240*, C from *DA 11572*, D from *Smith 616*.

except at margins; filament tube 0.8–1.2 mm. long, the anthers 0.4–0.6 mm. long, inserted distally within the tube. The fruits are subglobose to ellipsoid, 3–4 cm. in diameter, at length becoming nearly glabrate. In Fiji flowers have been noted between November and April, fruits in February and March.

TIPIFICATION: *Aglaia saltatorum* is typified by *Smith 1439* (US 1674954 HOLOTYPE; many ISOTYPES), collected March 29, 1934, on Namalata Islet, southern limestone section of Vanua Mbalavu.

DISTRIBUTION: Fiji (including Rotuma), Tonga, Niue, and the Horne Islands. The species is definitely indigenous in the Lau Group of Fiji and Tonga, but is probably an introduction on Niue (Sykes, 1970); it may be indigenous on Rotuma and Futuna in the Horne Islands. In Fiji the Viti Levu specimens are from cultivated plants, but material from Loma-i-Viti would appear to be indigenous.

LOCAL NAMES AND USES: The names used in the Lau Group are *langakali*, *langakali tangane*, *langakali yalewa*, and *langakali thavuthavu*, on Rotuma *rangaraki*. The fragrant inflorescences of the *langakali* are used in making necklaces used for festive occasions and by dancers. The inflorescences and fruits are also used to scent coconut oil, and the bark is reputed to be used for medicinal purposes.

AVAILABLE COLLECTIONS: VITI LEVU: TAILEVU (cult.): Verata, DA 2500, p. p., 5611, 5612; Raralevu, Weiner 72-2-38. MOTURIKI: Seemann 60. WAKAYA: Milne s. n. KORO: West coast, Smith 1079. VANUA MBALAVU: Northern limestone section, Smith 1476, 1507. LAKEMBA: Tumbou, DA 1137; near airport, Garnock-Jones 873. KAMBARA: On limestone formation, Smith 1240. FULANGA: Tothill 64. ONGEA NDRIKI: Navakatonga Bay, DA 3460. FIJI without further locality (or possibly from Tonga), U. S. Expl. Exped. (GH, NY, US 15573).

This attractive species, which had been confused with *Aglaia samoensis* A. Gray, is not of that relationship, although it may similarly be referred to sect. *Aglaia*, nor is it closely related to *A. axillaris*, the only other Fijian species definitely referable to sect. *Aglaia*. The closest relatives of *A. saltatorum* appear to be *A. psilopetala* (Wallis Islands) and *A. heterotricha* (Tonga), both species described in my 1952 review.

8. *Aglaia elegans* Gillespie in Bishop Mus. Bull. 83: 11. fig. 12. 1931; A. C. Sm. in Contr. U. S. Nat. Herb. 30: 491. 1952; J. W. Parham, Pl. Fiji Isl. 169. 1964, ed. 2. 240. 1972. FIGURE 126C.

Aglaia basiphylla sensu Seem. in Bonplandia 9: 254. 1861; C. DC. in DC. Monogr. Phan. 1: 613. 1878; non A. Gray.

Aglaia sp. A. Gray in Proc. Amer. Acad. Arts 5: 316. 1862, in Bonplandia 10: 35. 1862; A. C. Sm. in Contr. U. S. Nat. Herb. 30: 498. 1952.

An often slender tree 4-10 m. high, occurring in sometimes dense forest at elevations from near sea level to 1,075 m., with indument of young parts stellate, the hairs 0.15-0.2 mm. in diameter and composed of 15-20 essentially equal rays free nearly to base, usually persistent (but sometimes becoming sparse) on some foliage parts and on infructescences. The pinnate leaves do not exceed 25 cm. in length; petiole 3-7 cm. long; leaflets 5 or 7, with petiolules 5-10 (terminal to 15) mm. long and lanceolate- or elliptic-oblong blades 5-12 × 2.5-5 cm., rounded or obtuse at apex, the lowermost leaflets slightly the smallest. Inflorescences are not known; infructescences 2-8 cm. long; fruiting calyx 4-5 mm. long, with deltoid lobes about 1.5 mm. long and broad; fruits ellipsoid, 1.5-2 × 0.8-1.5 cm. Fruits have been obtained in months scattered throughout the year.

TIPIFICATION AND NOMENCLATURE: The type is *Gillespie 2005* (BISH HOLOTYPE; ISOTYPES at BISH, K, US), collected Aug. 6, 1927, in the vicinity of Tamavua, Naitasiri Province, Viti Levu. Gillespie cited seven collections, but only the type and two others (*Gillespie 2138, 3564*) are here referable, the remaining ones (*Gillespie 2784, 3348, 4437, Horne 858*) representing *Aglaia vitiensis* var. *minor*, a taxon with somewhat similar foliage but with very different indument. *Seemann 59*, the sole basis of de Candolle's concept of *A. basiphylla*, is here referred to *A. elegans*, together with two other collections that I did not place in 1952. Gray in 1862 had correctly opined that *Seemann 59* did not represent his *A. basiphylla*.

DISTRIBUTION: Endemic to Fiji and now known from 19 collections, all here cited. All are from Viti Levu except for single collections from Vanua Levu and Taveuni.

LOCAL NAMES: *Kau toa* was initially recorded by Gillespie, *kula* and *misi* by Parham (1964, 1972), but I have located no collections of the species bearing these names. Other names are *thavuthavu* (Naitasiri) and *langkali* (Thakaundrove).

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mt. Evans Range, *Greenwood 1142, 1256*; upper slopes of Mt. Koromba, *Smith 4664*. SERUA: Inland from Navutulevu, *DA 13879, DF 236*; hills west of Waivunu Creek, between Ngaloa and Korovou, *Smith 9301*. NAMOSI: Hills bordering Wainavindrau Creek, vicinity of Wainimakutu, *Smith 8558*. RA: Mataimeravula, vicinity of Rewasa, near Vaileka, *Degener 15422*. NAITASIRI: Central road, *MacDaniels 1143*; Tholo-i-suva, *DA 10197, 11572, 11969*; vicinity of Tamavua, *Gillespie 2138*; vicinity of Nasinu, *Gillespie 3564*. REWA: Mt. Korombamba, *DA 3859*; vicinity of Suva, *Tohill 93*. VANUA LEVU: THAKAUNDRIVE: Hills west of Mbutha Bay, Natewa Peninsula, *Smith 809*. TAVEUNI: *Seemann 59*.

Gillespie referred *Aglaia elegans* to sect. "*Euaglaia*," although he did not see flowering material, which in fact is still not at hand, although the species is reasonably frequent on Viti Levu. Because of its general similarity to *A. venusta*, I believe that its placement will prove to be in sect. *Hearnia* rather than sect. *Aglaia*, should those sections prove tenable.

9. *Aglaia venusta* A. C. Sm. in Contr. U. S. Nat. Herb. 30:492. 1952; J. W. Parham, Pl. Fiji Isl. 169. 1964, ed. 2. 240. 1972. FIGURE 126D.

Slender shrub to 4 m. high, apparently rare in dense forest at an elevation of 300–700 m., with indument of young parts stellate, the hairs 0.1–0.2 mm. in diameter, composed of 8–17 rays free nearly to base, subsistent on some foliage parts and on infructescences. The pinnate leaves have the petiole 2–4 cm. long, the leaflets 7 or 9, with petiolules 3–6 (terminal to 8) mm. long and lanceolate-oblong blades 4–7 × 1.2–2 cm. and rounded at apex. The compact, few-flowered inflorescences are up to 1.5 cm. long at anthesis; calyx lobes 1–1.2 mm. long; petals 1–1.5 mm. long and broad, pilose without except at margins; filament tube 0.3–0.5 mm. long, the anthers borne on its margin, about 0.5 mm. long. The infructescences elongate to about 4 cm., the calyx is slightly accrescent, and the fruits are ellipsoid, up to 2 × 1.3 cm. The single known collection bore flowers and fruits.

TIPIFICATION: The type is *Smith 616* (US 1676177 HOLOTYPE; many ISOTYPES), collected Nov. 28, 1933, on the southwestern slope of Mt. Mbatini, Thakaundrove Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and known only from the type collection.

LOCAL NAME: *Kula*.

The slender habit, more numerous and smaller leaflets, congested infructescences, and smaller fruiting calyx distinguish *Aglaia venusta* from its only close ally, *A. elegans*.

10. *Aglaia basiphylla* A. Gray, Bot. U. S. Expl. Exped. 1:237. 1854; C. Muell. in Walp. Ann. Bot. Syst. 4:387. 1857; Seem. Viti, 434. 1862, Fl. Vit. 37. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 136. 1890; A. C. Sm. in Contr. U. S. Nat. Herb. 30:493. 1952; J. W. Parham, Pl. Fiji Isl. 169. 1964, ed. 2. 240. 1972.

Slender tree 4–8 m. high, infrequent in dense forest at elevations of 300–600 m., with the indument of young parts stellate, the hairs in their basal portion 0.1–0.2 mm. in diameter and composed of 20–25 rays free nearly to base or at least in distal half but also with many conspicuous rays 0.7–1.5 mm. long, the indument persistent on some foliage parts and on infructescences. The pinnate leaves are sessile or subsessile; petiole below basal leaflets (or their scars) none or up to 1 cm. long; leaflets 5 or 7 (the lowermost greatly reduced and simulating stipules), the petiolules of upper and terminal leaflets 5–15 mm. long, the blades lanceolate-oblong, 5–15 × 1.8–4.5 cm.,

rounded or obtusely cuspidate at apex. Inflorescences are still unknown; infructescences compact, up to 4 cm. long including the few fruits; fruiting calyx about 3 mm. long and 4 mm. in diameter, copiously pilose, the lobes deltoid, about 1.5 mm. long and broad; fruits ellipsoid, up to 2×1.2 cm., tardily subglabrate. All available collections are in fruit, as far as noted obtained in January, July, and September.

TYPIFICATION: The type is *U. S. Expl. Exped.* (US 15569 HOLOTYPE; ISOTYPE at GH), collected in 1840 on Ovalau.

DISTRIBUTION: Endemic to Fiji and known only from southern Viti Levu and Ovalau; the Graeffe collection cited below may also be from Namosi Province.

AVAILABLE COLLECTIONS: VITI LEVU: NAMOSI: Northern slopes of Korombasambasanga Range, in drainage of Wainavindrau Creek, *Smith 8704*. VITI LEVU without further locality, *Graeffe 1551*. OVALAU: Slopes of Mt. Korotolutolu, west of Thawathi, *Smith 8055*; above Levuka, trail to west coast, *Gillespie 4342.1*.

Aglaia basiphylla, of which flowers are still unknown, seems related to the two following species in type of indument and basic foliage characters. It is well marked by having leaves with the lowermost leaflets essentially basal on the leaf, greatly reduced, and simulating stipules.

11. *Aglaia greenwoodii* A. C. Sm. in *Bishop Mus. Bull.* **141**: fig. 40. 1936, in *Contr. U. S. Nat. Herb.* **30**: 494. 1952; J. W. Parham, *Pl. Fiji Isl.* **169**. 1964, ed. 2. 240. 1972. FIGURE 122E.

An often slender tree 3–12 m. high (rarely noted as a shrub 1 m. high), occurring with some frequency at elevations from near sea level to 900 m. in dense, open, or secondary forest or in the thickets of crests and ridges, with the indument of young parts stellate, the hairs in their basal portion 0.2–0.3 mm. in diameter and composed of 10–20 rays free nearly to base but also with many conspicuous rays 0.5–1 mm. long, the indument persistent on some foliage parts and on infructescences. The pinnate leaves have petioles 2–8 cm. long; leaflets usually 7 or 9 (3–11), the lower ones only slightly reduced, the petiolules 5–15 (terminal to 20) mm. long, the blades oblong or lanceolate-elliptic, (4–) 6–14 \times (1.5–) 2–5.5 cm., obtuse at apex. The inflorescences are compact and few-flowered, 1–2 cm. long at anthesis; calyx lobes oblong, 1.5–2 \times about 1 mm.; petals 2–3 mm. long and broad, pilose on exposed outer surfaces; filament tube about 1 mm. long, with anthers about 0.8 mm. long borne on its margin. The infructescence develops to about 6 cm. in length including fruits, the copiously pilose calyx about 4 mm. long and broad, the fruits ellipsoid, up to 2×1.5 cm., subsperisistently pilose. Flowers have been observed between October and April, fruits throughout the year.

TYPIFICATION: The species is based on *Greenwood 500A* (K HOLOTYPE), collected Feb. 25, 1925, near the Wainikoro River, Mathuata Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji, now known from four of the high islands and about 40 collections.

LOCAL NAMES AND USES: Names recorded once or twice each (and hence not reliable) are *tawatawa* (Mba), *tombuthe* (Ra), *kambi ni koro*, *Viti namboro*, *towiwi*, and *ndawandawa* (Naitasiri), *kaunithina* (Vanua Levu), *malandamu* (Mbuva), and *waihavuthavu* (Mathuata). The timbers are sometimes used for house-building and the saplings for spears.

REPRESENTATIVE COLLECTIONS: VITI LEVU: Mba: Mountains near Lautoka, *Greenwood 1067*; vicinity of Nalotawa, eastern base of Mt. Evans Range, *Smith 4455*; Nandala, south of Nandarivatu, *Degener 14374*. NANDRONGA & NAVOSA: Nambosewale, Nandrau, *DF 1176*. SERUA: Inland from Namboutini, *DA 13711*; hills east of Navua River, near Nukusere, *Smith 9110*. NAMOSI: Northern slopes of Korombasambasanga Range, in drainage of Wainavindrau Creek, *Smith 8713*; slopes of Mt. Voma, *Gillespie 2470*; track to Mt. Vakarongasiu, *DA 16106*. Ra: Mataimeravula, vicinity of Rewasa, near Vaileka, *Degener 15334*. NAITASIRI: South of Matawailevu, Wainimala River, *St. John 18239*; Waimanu River, *DA 661*; Tamavua, *Yeoward 620*. KANDAVU: Vicinity of Naikorokoro, *DA 12627*. OVALAU: Hills west of Lovoni Valley, on ridge

south of Mt. Korolevu, *Smith 7531*. VANUA LEVU: MBUA: Lower Wainunu River Valley, *Smith 1738*. MATHUATA: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, *Smith 6720*. MATHUATA-THAKAUNDRIVE boundary: Crest of Korotini Range, between Navitho Pass and Mt. Ndelai-koro, *Smith 528*. THAKAUNDRIVE: Navonu Creek, Natewa Peninsula, *DA 15071*.

Aglaia greenwoodii and *A. fragilis*, together with *A. basiphylla*, form a coherent cluster of species readily separable from one another by the foliage characters utilized in the key.

12. *Aglaia fragilis* A. C. Sm. in *Sargentia* 1:45. 1942, in *Contr. U. S. Nat. Herb.* 30:495. 1952; J. W. Parham, *Pl. Fiji Isl.* 169. 1964, ed. 2. 240. 1972. FIGURE 122F.

Undershrub or small tree to 5 m. high, found locally in dense, wet forest at elevations of 600–1,130 m., with the indument of young parts stellate, the hairs in their basal portion about 0.2 mm. in diameter and composed of 8–20 rays free nearly to base but also with many conspicuous rays 0.2–0.7 mm. long, the indument persistent on lower surface of leaflets and other foliage and infructescence parts. The leaves are pinnate (very rarely unifoliolate), with distinct petioles 1.5–3 cm. long; leaflets (1 or) 3 or 5, the petiolules 2–3 (terminal to 10) mm. long, the blades lanceolate-elliptic, obtuse at apex, the lateral ones 2–9 × 1–3 cm., the terminal one up to 13 × 4.5 cm. The inflorescences are 2–7 cm. long, copiously pilose on all exposed parts; calyx lobes about 1.5 × 0.6 mm.; petals 2–2.5 × 1–1.5 mm.; filament tube 1–1.2 mm. long, with inflexed anthers about 0.7 mm. long borne on its margin. The fruiting calyx enlarges to about 4 × 4 mm., and the subpersistently pilose fruits are ellipsoid, up to 2.5 × 1.5 cm. Flowers have been observed only in March, fruits between March and November.

TIPIFICATION: The type is *Degener 14680* (A HOLOTYPE; ISOTYPES at BISH, K, NY, US), collected March 6, 1941, near Nauwangga, south of Nandarivatu, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from northern Viti Levu.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, *Tohill 91*, *Parks 20741*, *Gillespie 3691*; near summit of Mt. Nanggaranambuluta, east of Nandarivatu, *Gillespie 3794*, *Stauffer & Koroiveibau 5838*, *Webster & Hildreth 14316*; hills east of Nandala Creek, south of Nandarivatu, *Smith 5937*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 12668* (*Melville et al. 7044*).

13. *Aglaia archboldiana* A. C. Sm. in *Sargentia* 1:44. 1942, in *Contr. U. S. Nat. Herb.* 30:495. 1952; J. W. Parham, *Pl. Fiji Isl.* 169. 1964, ed. 2. 240. 1972.

FIGURES 122G, 127.

Usually slender tree 5–17 m. high, found from near sea level to about 970 m. in dense or dry forest, with the indument stellate, the hairs in their basal portion 0.15–0.2 mm. in diameter and composed of 12–20 rays free nearly to base but also with many diverse and conspicuous rays 0.2–1.3 mm. long, the indument persistent on lower surfaces of leaflets and other foliage and infructescence parts. The large, pinnate leaves have petioles 8–18 cm. long; leaflets 5 or 7 (or 9), the petiolules 5–15 (terminal to 20) mm. long, the blades elliptic- or obovate-oblong, (10–) 15–35 × 5–14 cm., obtuse at base, cuspidate or short-acuminate at apex. The inflorescences are diverse in size, often copiously paniculate and up to 25 cm. long and broad; calyx lobes 0.8–1.2 × 1.5–2 mm., copiously pilose; petals glabrous, about 2 × 2 mm.; filament tube carnosose, 1–1.5 mm. long, with inflexed anthers about 0.8 mm. long borne on its margin. The calyx is incrassate in fruit, and the persistently pilose fruits are ellipsoid-subglobose, 2–4 cm. in diameter. Flowers have been observed in November and December, fruits in months scattered throughout the year.

TIPIFICATION: The type is *Degener & Ordenez 13705* (A HOLOTYPE; ISOTYPES at BISH, K, NY, US), collected Nov. 29, 1940, in the vicinity of Ngaloa, Serua Province, Viti Levu.

FIGURE 127. *Aglaia archboldiana*; A, distal portion of branchlet, with a leaf and infructescences, × 1/4; B, ultimate cluster of functionally ♂ flowers, × 4; C, flower with 3 petals removed, showing staminal tube, × 20; D, portion of staminal tube with 2 anthers, and pistillode, × 30. A from *DA 17214*, B–D from *Smith 9231*.



DISTRIBUTION: Endemic to Fiji and now known from Viti Levu and Ovalau.

LOCAL NAMES: Names recorded only once or twice are *sasawira* and *kali* (Mba) and *vesida* (Serua).

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Hills between Nandala and Nukunuku Creeks, along trail from Nandarivatu toward Lewa, *Smith 6199*; vicinity of Nandarivatu, *Gillespie 3709, Smith 5046, DA 12546*; Mt. Matomba, near Nandala, south of Nandarivatu, *Degener 14506*; hills east of Nandala Creek, *Smith 5928*; hills between Nggaliwana and Nandala Creeks, south of Nauwanga, *Smith 5829*. SERUA: "In hills," *Greenwood 1020*; Nathengathenga Creek, upper Navua River, *DA L.13335*; hills west of Waivunu Creek, between Ngaloa and Korovou, *Smith 9231*; hills between Wainigere and Waisee Creeks, between Ngaloa and Wainiyambia, *Smith 9548*. REWA: Mt. Korombamba, *DA 17214*. OVALAU: Hills southeast of valley of Mbureta River, *Smith 7448*. FIJI without further locality, *DA L.13336*.

Aglaia archboldiana and *A. parksii* are a pair of species of sect. *Hearnia* readily characterized by their large leaves and fruits and their copious indument of trichomes with rays of diverse lengths. They are readily separable by their petals (glabrous in *A. archboldiana* and pilose in *A. parksii*) and fruits (proportionately narrower in *A. parksii*); foliage characters are less satisfactory but are reasonably consistent.

14. *Aglaia parksii* A. C. Sm. in Bull. Torrey Bot. Club **70**: 541. 1943, in J. Arnold Arb. **27**: 320. 1946, in Contr. U. S. Nat. Herb. **30**: 496. 1952; J. W. Parham, Pl. Fiji Isl. **169**. 1964, ed. 2. **240**. 1972.

Usually slender tree 5–8 m. high, infrequent in dense forest at elevations of 30–250 m., with the indument of young parts stellate, the hairs in their basal portion about 0.2 mm. in diameter and composed of 15–25 rays free at least in the distal half but also with many conspicuous rays 0.5–1 mm. long, the indument fugacious from lower surfaces of leaflets but subsistent on other foliage and infructescence parts. The pinnate leaves have petioles 8–18 cm. long; leaflets (7 or) 9 or 11, the petiolules 6–16 (terminal to 30) mm. long, the blades oblong or obovate-oblong, (7–) 10–25 × (3–) 5–8 cm., inaequilaterally narrowly or broadly obtuse to rounded and often subcordate at base, obtuse at apex. The inflorescences are diverse in length, sometimes amply panicleate and up to 13 cm. long; calyx lobes 0.5–0.7 × about 1 mm.; petals (fully mature ones not seen) pilose on exposed surfaces; filament tube with marginal anthers (mature stamens not seen). The fruiting calyx is incrassate; the closely and persistently pilose fruits are oblong-ellipsoid, often curved, up to 4 × 1.5 cm. Young flowers have been obtained in May, September, and October, fruits in the same months and into December.

TYPIFICATION: The species is based on *Parks 20076* (BISH HOLOTYPE; photo and fragment at US), collected May 24, 1927, near Tholo-i-suva, Naitasiri Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and known only from southeastern Viti Levu.

AVAILABLE COLLECTIONS: VITI LEVU: SERUA: Hills between Navua River and Wainiyavu Creek, near Namuamua, *Smith 8970*; hills east of Navua River, near Nukusere, *Smith 9088*; hills north of Ngaloa, in drainage of Wainigere Creek, *Smith 9427*. NAMOSI: Hills bordering Wainavindrau Creek, vicinity of Wainimakutu, *Smith 8856*. NAITASIRI: Near Nasinu, *Greenwood 1136*.

5. *DYSOXYLUM* Bl. Bijdr. Fl. Ned. Ind. **172**. 1825; Seem. Fl. Vit. **36**. 1865; C. DC. in DC. Monogr. Phan. **1**: 480. 1878; Harms in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **19b1**: 160. 1940; A. C. Sm. in Contr. U. S. Nat. Herb. **30**: 499. 1952; Penn. & Styles in *Blumea* **22**: 504. 1975.

Didymocheton Bl. Bijdr. Fl. Ned. Ind. **177**. 1825; Harms in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **19b1**: 156. 1940.

Trees or shrubs, with indument of simple hairs, sometimes polygamodioecious; leaves paripinnate or imparipinnate (rarely 3-foliolate), the leaflet blades entire, often inaequilateral at base (juvenile leaflet blades sometimes deeply sinuate-undulate);

inflorescences axillary or sometimes borne on branchlets or old wood, paniculate, racemose, or thyrsoïd, rarely spicate, often many-flowered, the flowers ♂ or functionally ♂ or ♀, sometimes subtended by several-numerous, imbricate bracteoles; calyx shallowly to deeply (3 or) 4- or 5 (or) 6-lobed or with separate sepals, these imbricate or less often valvate; petals (3 or) 4 or 5 (or) 6, free, valvate or imbricate, sometimes proximally connate and adnate to filament tube; filament tube cylindrical, often nearly as long as petals, crenulate or dentate at apex or with short appendages, the anthers (5-) 8-10 (-15), inserted within filament tube, sometimes partially exerted (lacking pollen in ♀ flowers); disk free, tubular or infrequently cyathiform, crenulate or lobed to entire at apex; ovary ovoid or oblong, 2-5-locular (rudimentary in ♂ flowers), the ovules 1 or 2 per locule (if 2 collateral or superposed), the style often slender, the stigma discoid to capitate; fruit a capsule, often coriaceous, glabrous or pilose, loculicidally 2-5-valved (sometimes tardily so or seemingly indehiscent), each locule with 1 or 2 seeds, these with an arillose or sarcotesta.

LECTOTYPE SPECIES: *Dysoxylum alliaceum* (Bl.) Bl. (*Guarea alliacea* Bl.) (vide Harms in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19b1: 161. 1940). The type species of *Didymocheton* is *D. nutans* Bl.

DISTRIBUTION: Southeastern Asia (from southern China) through Malesia to Australia and New Zealand, and eastward to the Caroline Islands, Tonga, Niue, and Samoa, with 200-250 species (about 60 species according to Pennington and Styles, 1975). Nine species are indigenous in Fiji, all here considered endemic.

Didymocheton was maintained as a distinct genus by Harms (1940) and a few other recent authors. The more frequently adopted inclusive concept of *Dysoxylum* (cf. Pennington and Styles, 1975) is here accepted, although two sections are readily recognized in our region on the basis of calyx and fruit characters. In the following key the first six species fall into *Dysoxylum* in its limited sense, the last three into *Didymocheton* if that is retained at some level.

Our species often have fragrant flowers; the petals and staminal tube are white or cream-colored to pale or greenish yellow; the fruits turn from green to yellowish and at length to rusty-brown or orange-brown, with reddish arillodes or sarcotestas.

KEY TO SPECIES

Calyx gamosepalous but sometimes deeply lobed, subtended by 1-3 minute bracteoles not forming a cupule; fruits with a thick, hard pericarp, very tardily dehiscent or seemingly indehiscent, usually early glabrate.

Petals connate into a tube in proximal half or 1/3 and adnate to lower part of filament tube; leaflets with short petiolules (2-12 mm. long on distal margin), the blades inaequilaterally obtuse to subcordate at base, with the distal base of blade often touching leaf rachis.

Leaflet blades copiously and persistently soft-pilose beneath, the costa often persistently pilose above; leaf rachis pilose; inflorescence rachis and branchlets copiously spreading-pilose.

1. *D. quercifolium*

Leaflet blades soon glabrate on both surfaces except for persistently barbellate nerve axils beneath; leaf rachis glabrous; inflorescence rachis and branchlets minutely and inconspicuously pilose.

2. *D. richii*

Petals free from one another and from filament tube (or connate and adnate to tube only at extreme base); leaflets with petiolules variable (essentially none to 30 mm. long), the blades inaequilaterally attenuate to obtuse or rounded at base, with the distal base of blade not touching leaf rachis.

Flowers comparatively small, 4-merous; calyx 1.2-1.5 mm. long, with deltoid lobes 0.2-0.5 mm. long; petals 1.7-2 × 0.8-1 mm.; filament tube 1-1.3 mm. long, the anthers 6-8, 0.7-0.8 mm. long; disk to 0.5 mm. long; inflorescences axillary, compactly paniculate, 4-10 cm. long; leaves usually 18-24 cm. long and with 6 or 8 leaflets, the petiolules 0-5 mm. long, the blades seldom exceeding 12 × 4 cm., inaequilaterally attenuate at base. 3. *D. aliquantum*

Flowers comparatively large; calyx at least 2 mm. long, with ovate to suborbicular lobes at least 1 mm. long; petals at least 4 × 1.5 mm. at anthesis; filament tube at least 2 mm. long; disk at least 1 mm. long; leaves 14-60 cm. long and with 6-16 leaflets, the petiolules at least 5 mm. long, the blades 5.5-22 × 3-9 cm., inaequilaterally acute to obtuse or rounded at base.

Inflorescences paniculate, 6–15 cm. long at anthesis, axillary; flowers 5-merous; petals at anthesis 5 mm. or more long; anthers 10 (rarely more); disk 1.3 mm. or more long; infructescences axillary, usually with several or many fruits.

Flowers robust; calyx 4–5 × 5–6 mm., the lobes 2–2.5 × 3–4 mm.; petals 9–15 × 3–8 mm.; filament tube 6–10 mm. long, the anthers sometimes more than 10, 2–2.5 mm. long; disk about 2.5 mm. long, sericeous within; inflorescences copiously sericeous on exposed parts including calyx and petals; mature fruits not known, the immature ones copiously velutinous-tomentellous.

4. *D. myriandrum*

Flowers smaller; calyx about 2 × 2.5 mm., the lobes about 1–1.5 mm.; petals 5–6 × 1.5–2 mm.; filament tube about 4 mm. long, the anthers about 1 mm. long; disk 1.3–1.5 mm. long, glabrous on both surfaces; inflorescences minutely strigillose on exposed parts including calyx and petals; mature fruits 2–3 × 1.5–2 cm., glabrous, copiously or sparsely lenticellate.

5. *D. lenticellare*

Inflorescences compact, simply racemose, not exceeding 3 cm. in length at anthesis, usually borne on branchlets below leaves; flowers 4-merous; calyx about 2 × 3 mm.; petals at anthesis about 4 × 2 mm.; anthers 7 or 8; disk about 1 mm. long; infructescences compact, often with a single fruit; fruits comparatively large, 3.5–4.5 × 1.5–3 cm., with a thick, woody, essentially lenticellate pericarp. 6. *D. gillespieanum*

Calyx with separate but imbricate sepals, subtended by several to numerous bracteoles, these free but often forming a cupule and simulating sepals; fruits with a comparatively thin pericarp, dehiscing at maturity, minutely but copiously and persistently velutinous.

Leaves 50–130 cm. long, with petioles up to 30 cm. long and with (9–) 13–21 leaflets; petiolules conspicuous, those of lateral leaflets 10–40 mm. long; leaflet blades 12–30 × 4–11 cm., attenuate to obtuse at base; inflorescences 20–130 cm. long; petals 4 or 5, 12–16 mm. long; filament tube retrorsely pilose without and conspicuously so within, the anthers 8 or 10; disk 4–5 mm. long.

7. *D. seemannii*

Leaves 20–55 cm. long, with petioles 4–16 cm. long and with 5–13 leaflets; petiolules of lateral leaflets to 6 mm. long (on shorter margin); lateral leaflet blades often appearing subsessile, 9–21 × 2.5–9.5 cm.; inflorescences 15–40 cm. long; petals 5–12 mm. long; filament tube glabrous or sparsely strigillose on both surfaces.

Petals 5, 9–12 mm. long; anthers 10, 1–1.2 mm. long; disk 3.5–4.5 mm. long; lateral leaflet blades obviously inaequilateral, rounded at base on distal side (distal half of blade longer than proximal half), glabrous at maturity or barbellate in nerve axils on lower surface. . . . 8. *D. tenuiflorum*

Petals 3–5, 5–10 mm. long; anthers 5 or 6 (or 7), 0.7–0.8 mm. long; disk 2–3 mm. long; lateral leaflet blades only slightly inaequilateral, acute to obtuse at base (or slightly rounded on proximal side and then the proximal half of blade longer than distal half), sometimes pilose on costa beneath.

9. *D. hornei*

1. *Dysoxylum quercifolium* (Seem.) A. C. Sm. in *Brittonia* 14: 245. 1962; J. W. Parham, Pl. Fiji Isl. 170. 1964, ed. 2. 243. 1972. FIGURES 128C & D, 129A.

Dracontomelon sp.? Seem. in *Bonplandia* 9: 255. 1861, Viti, 435. 1862.

Brucea ? sp. Seem. in *Bonplandia* 9: 255. 1861, Viti, 435. 1862; A. Gray in *Bonplandia* 10: 35. 1862.

Brucea quercifolia Seem. Fl. Vit. 33. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 135. 1890; A. C. Sm. in J. Arnold Arb. 36: 280. 1955; A. C. Sm. & W. Stern in *Brittonia* 14: 237. fig. 1, 11, 15. 1962.

Dracontomelon pilosum Seem. Fl. Vit. 52. 1865; A. C. Sm. & W. Stern in *Brittonia* 14: 237. fig. 2, 7, 13. 1962.

Dracontomelon pilosum Seem. ex Drake, Ill. Fl. Ins. Mar. Pac. 145. 1890.

Dysoxylum pilosum A. C. Sm. in *Sargentina* 1: 40. 1942, in *Contr. U. S. Nat. Herb.* 30: 501. 1952; A. C. Sm. & W. Stern in *Brittonia* 14: 237. fig. 8. 1962.

Tree 6–15 m. high, occurring in dense or dry forest from near sea level to about 900 m., the young parts copiously pilose. The leaves are as long as 90 cm., with petioles to 38 cm. long and a pilose rachis; leaflets (10–) 13–23, the petiolules 2–10 mm. long, the blades falcate-oblong, 9–20 × 2.5–7 cm. (lower ones sometimes only 4 × 2 cm.), unequally obtuse to subcordate at base, obtusely cuspidate at apex, copiously and persistently soft-pilose beneath. The inflorescences are paniculate, many-flowered, to 35 cm. in length, copiously pilose, with sessile, fragrant flowers, these 4- or 5-merous; calyx 1–1.5 mm. long; petals 5–7.5 × 1–1.3 mm., proximally coherent into a tube; filament tube subequal to petals, densely pilose without and sparsely so proximally within, the anthers 8–10, 0.7–0.8 mm. long; disk glabrous on both surfaces; ovary copiously sericeous; lower part of style sparsely sericeous. The infructescences are 8–30

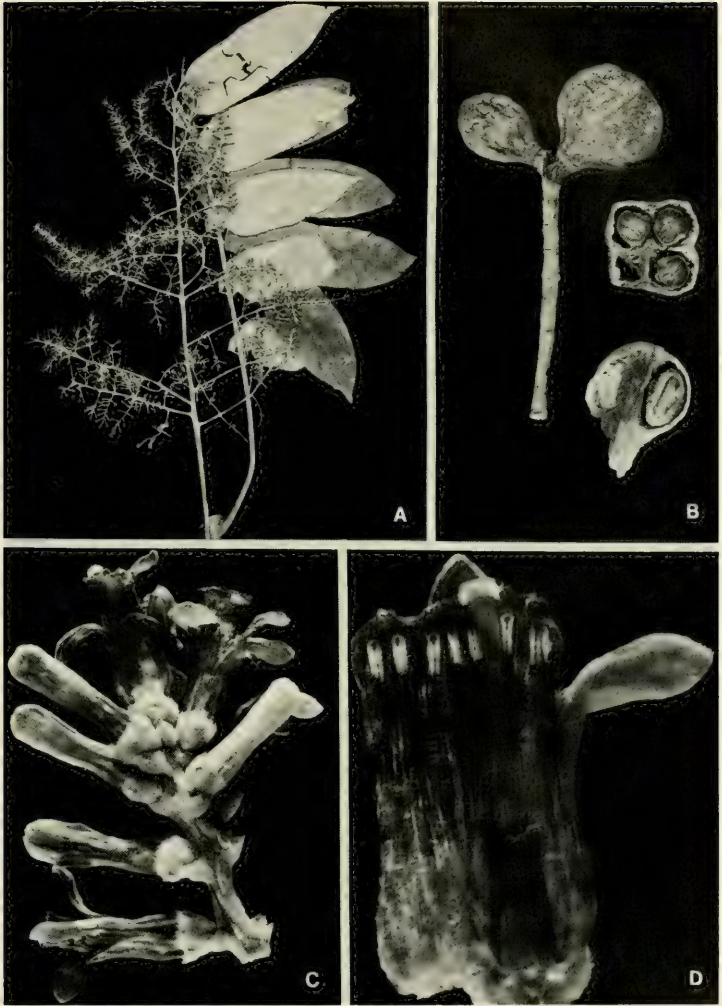


FIGURE 128. A & B, *Dysoxylum richii*; A, leaf and inflorescence, $\times 1/4$; B, fruits, showing cross section and longitudinal section, $\times 1$. C & D, *Dysoxylum quercifolium*; C, ultimate cluster of flowers, $\times 4$; D, 4-merous flower with 2 calyx lobes and 2 petals removed, showing inner surface of staminal tube with 8 anthers, disk surrounding base of gynoecium, style, and stigma, $\times 10$. A from *Smith 1513*, B from *Smith 6348*, C & D from *DA 11427*.

cm. long; fruits subglobose, sometimes inconspicuously 4-lobed, to 15 mm. in diameter, often copiously lenticellate. Flowers have been noted between December and August, fruits in most months.

TYPIFICATION: Three types are involved in the synonymy. That of *Brucea quercifolia* is *Seemann 105* (K HOLOTYPE), collected in 1860 on the "Namosi" (Waindina) River,

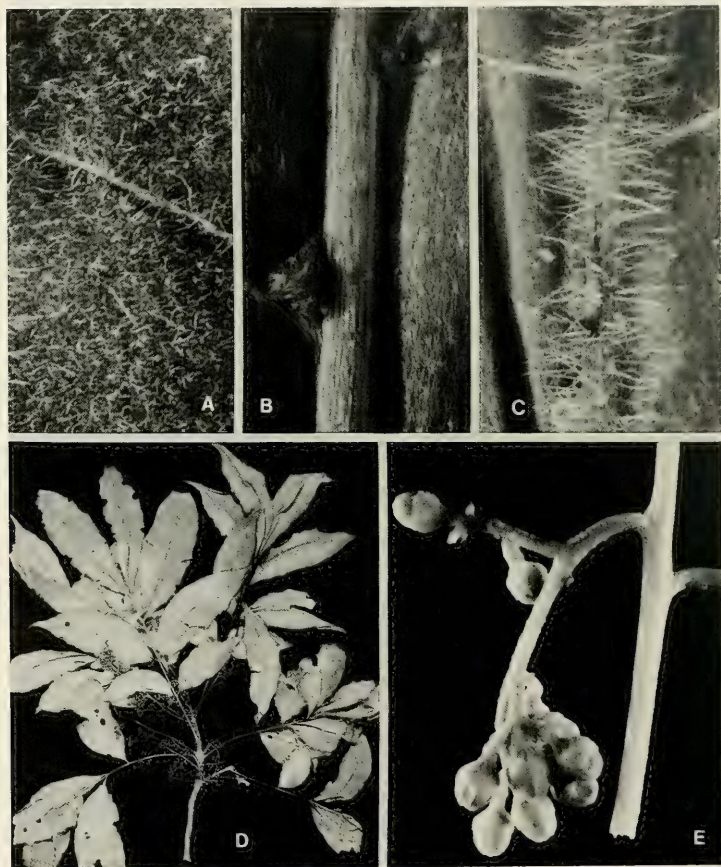


FIGURE 129. A, *Dysoxylum quercifolium*; portion of lower surface of leaflet blade, $\times 10$. B, *Dysoxylum richii*; portion of lower surface of leaflet blade along costa, showing axillary hair tufts, $\times 10$. C-E, *Dysoxylum aliquantulum*; C, portion of lower surface of leaflet blade, showing indumentum on costa, $\times 10$; D, distal portion of branchlet, with foliage and inflorescences, $\times 1/4$; E, lateral branch of panicle, with flowers, $\times 4$. A from DA 11427, B from St. John 18231, C from Smith 5832, D & E from DA 15605.

Namosi Province, Viti Levu. The type of *Dracontomelon pilosum* is Seemann 100 (κ HOLOTYPE), obtained in Fiji in 1860 without definite locality. Both of Seemann's collections consist of foliage only, and that of the *Brucea* was from a juvenile plant. *Dysoxylum pilosum* is based on Greenwood 396 (A HOLOTYPE; ISOTYPES AT κ), collected Aug. 28, 1922, in mountains near Lautoka, Mba Province, Viti Levu. (Four sheets of this number at κ bear the dates Dec. 2, 1921, and Feb. 21, 1922, and are perhaps not strictly isotypes in the sense of ICBN, Art. 7.6; however, Greenwood often revisited the same tree in order to obtain fuller material, and one may assume that in fact the A and κ specimens are all from the same plant.) A study of leaf anatomy permitted the writer and W. L. Stern to clarify the nomenclatural vicissitudes of this species in 1962; Seemann's two type specimens are illustrated in fig. 1 and 2 of that paper.

DISTRIBUTION: Endemic to Fiji and apparently to Viti Levu, now known from about 35 collections.

LOCAL NAMES AND USE: Recorded names (more or less generic on Viti Levu) are *sasawira*, *mala*, *tarawau*, *tarawau kei rakaka*, and *tarawau kei rakaraka*. The plant is said to be a timber tree extensively cut in local areas.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: North of Lomolomo, Degener & Ordenez 13715; Mt. Evans Range, Greenwood 1217; Mbalevatu road, inland from Mba, O. & I. Degener 32005; vicinity of Mbukuya, Mangondro Tikina, DF 1273. NANDRONGA & NAVOSA: Nausori Highlands, DA 15614; southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, Smith 4589; Naruku, vicinity of Mbelo, near Vatukarasa, Degener 15310. NAITASIRE: Vicinity of Nanduna, DA 13233; Waimanu River, DA L.13341 or L.13342 (Berry 23); near Nasinu, Greenwood 1133. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, Smith 7102; L. Hunt's farm, DA 11427. REWA: Vicinity of Suva, Meebold 16907. An interesting collection without data is DA 267 (SUVA), represented by a juvenile leaf showing the cutting of the type specimen of *Brucea quercifolia*.

The sharp differences between *Dysoxylum quercifolium* and *D. richii* in leaflet indument and fine venation were illustrated by Smith and Stern (1962: fig. 13 and 15, *D. quercifolium*, vs. fig. 14, *D. richii*).

2. *Dysoxylum richii* (A. Gray) C. DC. in DC. Monogr. Phan. 1: 511. 1878; Drake, Ill. Fl. Ins. Mar. Pac. 409. 1892; A. C. Sm. in Contr. U. S. Nat. Herb. 30: 502. 1952; A. C. Sm. & W. Stern in Brittonia 14: 239. fig. 9, 14. 1962; J. W. Parham, Pl. Fiji Isl. 170. 1964, ed. 2. 243. 1972.

FIGURES 128A & B, 129B.

Didymochiton richii A. Gray, Bot. U. S. Expl. Exped. 1: 239. 1854, Atlas, pl. 20. 1856; C. Muell. in Walp. Ann. Bot. Syst. 4: 387. 1857; Seem. Viti, 434, as *Didimochyton r.* 1862.

Dysoxylum alliaceum sensu Seem. Fl. Vit. 36, p. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 136, p. 1890; non Bl.

Tree 5–25 m. high, found in some abundance from near sea level to an elevation of about 1,000 m. in different types of forest, in thickets, and even on the edges of mangrove swamps, the young parts closely pilose but the indument usually evanescent, a strong alliaceous odor emitted by bruised parts. The leaves are 35–80 cm. long, glabrate except for persistently barbellate nerve axils of lower leaflet surfaces, with petioles 6–25 cm. long; leaflets (9–) 13–21, the petiolules 3–12 mm. long, the blades falcate-oblong, 8–20 × 2.5–6 cm. (lower ones sometimes only 4 × 2 cm.), inaequilaterally obtuse or rounded at base, obtusely cuspidate to acuminate at apex. The inflorescences are amply paniculate, many-flowered, 10–45 cm. long, minutely pilose on rachis and branchlets, the flowers sessile, 4- or 5-merous; calyx 0.7–1.2 mm. long; petals 3–6 × 0.7–1 mm., proximally coherent into a tube; filament tube nearly as long as petals, pilose without, the anthers 8 or 10. The infructescences are usually shorter than inflorescences due to breakage; fruits obovoid-subglobose, inconspicuously 4-lobed or bluntly angled, to 20 mm. in diameter, copiously lenticellate. Flowers and fruits are seen throughout the year.

TYPIIFICATION: The type is *U. S. Expl. Exped.* (US 42447 & 42448 HOLOTYPE; putative ISOTYPES at GH, K), collected in Fiji in 1840. Gray cited three localities: (1) Mbua Bay, Mbua Province, Vanua Levu, (2) Somosomo, Taveuni, and (3) Nukulau Island, Rewa Province, Viti Levu; it is not now possible to tie the specimens to precise localities.

DISTRIBUTION: Endemic to Fiji and widespread within the archipelago, now known from about 70 collections and 13 islands but certainly to be expected on many others.

LOCAL NAMES AND USES: Recorded names are *sasawira*, *sawira*, *mala*, *malamala*, *tarawau kei rakaka*, *tarawau kei rarakaka*, *tarawau kei thongge*, *tarawau ni Viti*, *ndondo tarawau*, and *makota* (in Lau). The species is sometimes cut commercially as a timber tree and is also used locally for houseposts; a leaf decoction is reportedly used for toothache in Naitasiri.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Northern portion of Mt. Evans Range, between Mt. Vatuyanitu and Mt. Natondra, *Smith 4355*; vicinity of Nandarivatu, *Degener 14539*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 15618*; vicinity of Thuvu, west of Singatoka, *DA 16022*. SERUA: Inland from Korovisilou, *DF 783 (Damanu KL-8)*. NAMOSI: Northern base of Korombasambasanga Range, in drainage of Wainavindrau Creek, *Smith 8650*. RA: Tuvavatu, vicinity of Rewasa, near Vaileka, *Degener 15376*. NAITASIRE: Wainamo Creek, near Matawailevu, Wainimala River, *St. John 18231*. REWA: Near Suva, *MacDaniels 1002*. KANDAVU: Namalata isthmus region, *Smith 53*. OVALAU: Hills east of Lovoni Valley, *Smith 7337*. KORO: Eastern slope of main ridge, *Smith 941*. NGAU: Hills east of Herald Bay, inland from Sawaieke, *Smith 7747*. VANUA LEVU: MBUA: Southern portion of Seatovo Range, *Smith 1513*. MATHUATA: Seanggangga Plateau, *DA 13465*. THAKAUNDRUVE: South coast near road to Salt Lake, *DA 16831*. TAVEUNI: Vicinity of Waiyevo, *Gillespie 4736*. MATUKU: *Bryan 244*. NAITAMBA: *DA 3788*. VANUA MBALAVU: Northern limestone section, *Smith 1496*. LAKEMBA: Tumbou River, *Garnock-Jones 842*. KAMBARA: On limestone formation, *Smith 1290*.

With the preceding species (*Dysoxylum quercifolium*), *D. forsteri* (Juss.) C. DC., of Tonga and Niue, and *D. samoense* A. Gray, of Samoa, *D. richii* constitutes a well-marked group of taxa of the Fijian Region (Smith, 1952, pp. 500-505).

3. *Dysoxylum aliquantum* A. C. Sm. in *Pacific Sci.* 23: 383. 1969; J. W. Parham, Pl. Fiji Isl. ed. 2. 241. 1972. FIGURES 129C-E, 130.

Dysoxylum bijugum sensu Seem. Fl. Vit. 37, p. p., quoad spec. vit. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 136. 1890; A. C. Sm. in *Contr. U. S. Nat. Herb.* 30: 518. 1952; non sensu typi.

Tree 10-26 m. high, with a trunk up to 70 cm. in diameter, occurring in upland forest at elevations of 600-900 m. The young parts are obscurely strigillose or spreading-pilose, usually soon glabrate, but on occasional specimens a sometimes copious indument of pale brown spreading hairs about 1 mm. long persistent on rachis, petiolules, and costa of lower leaflet blade surface. The leaves are (10-) 18-24 cm. long, with petioles 2.5-5 cm. long; leaflets (4-) 6 or 8, the petiolules essentially none or to 5 mm. long, the blades lanceolate-elliptic, (5-) 8-12 (-14) × (2-) 2.5-4 (-5.5) cm., inaequilaterally attenuate at base and decurrent on petiolule, gradually attenuate at apex. The axillary inflorescences are compactly paniculate, 4-10 cm. long, sparsely sericeous-puberulent on exposed parts; flowers 4-merous (as far as observed), the pedicels 0.5-1 mm. long; calyx 1.2-1.5 mm. long, 1.7-2.2 mm. in diameter; petals 1.7-2 × 0.8-1 mm.; filament tube 1-1.3 mm. long, glabrous on both sides, the anthers 6-8, 0.7-0.8 mm. long; disk to 0.5 mm. long, obscurely hispidulous. The axillary infructescences are 10 cm. long or less, with 2-6 fruits on stout pedicels (3-5 mm. long and in diameter); fruits obovoid, 20-25 × 14-18 mm., rounded at apex, the pericarp hard, copiously lenticellate, the locules (as far as observed) 3 and 1-seeded. Flowers and fruits have been obtained in February and fruits also in December.

TYPIIFICATION: The species was based on *DA 15605* (coll. *E. Damanu*) (BISH HOLOTYPE; ISOTYPES at MASS, SUVA), collected Feb. 5, 1968, in the Nausori Highlands, Nandronga & Navosa Province, Viti Levu. Seemann's nomenclaturally valid combi-

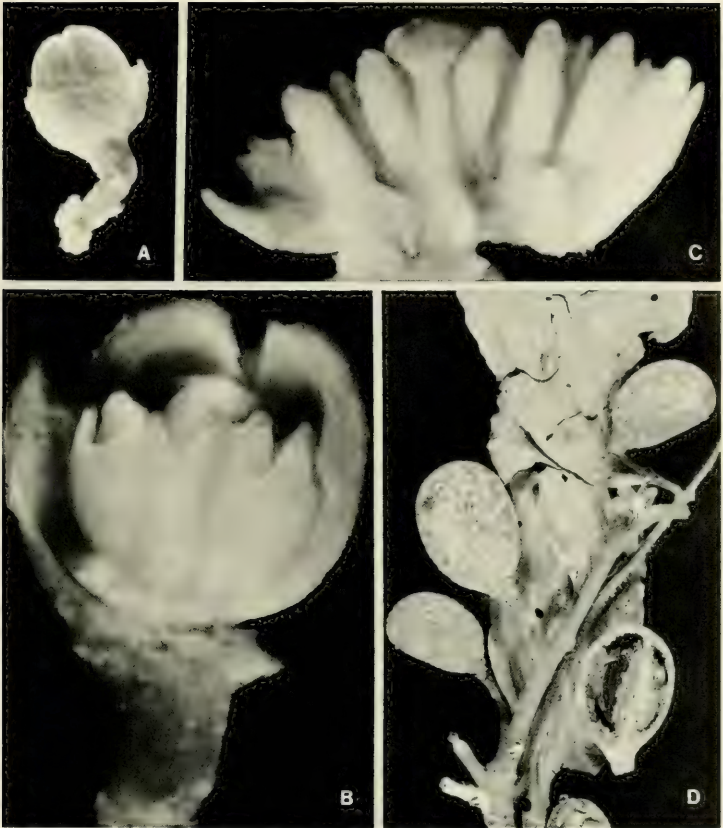


FIGURE 130. *Dysoxylum aliquantum*; A, flower, $\times 10$; B, flower with 2 calyx lobes and 2 petals removed, showing staminal tube, projecting anthers, and stigma, $\times 30$; C, gynoecium, with inner surface of staminal tube (6 complete anthers remaining) and inner surface of disk, $\times 30$; D, fruits, one cut longitudinally, $\times 1$. A-C from DA 15605, D from Smith 5832.

nation of 1865 is based on *Trichilia bijuga* Labill., a New Caledonian plant referred to *Dysoxylum lessertianum* (Juss.) Benth. by de Candolle in 1878. The identity of *Seemann 104* (cited by him as from Viti Levu but labelled as from Taveuni) became apparent only with the collection of comparatively recent material.

DISTRIBUTION: Endemic to Fiji and known with certainty only from northwestern Viti Levu; the locality of Seemann's specimen must remain equivocal.

LOCAL NAMES AND USE: Recorded names are *sorovulu*, *tarawau kei rakaka*, *mala-mala*, and *kauningai* (the last to be questioned). The species is noted as a timber tree, but presumably it is not commercially important.

AVAILABLE COLLECTIONS: VITI LEVU: Mba: Mt. Evans Range, *Greenwood 1221*; ridge above Mbukuya, Mangondro Tikina, *Berry 104*; Yavu Creek, Mba River headwaters, *Berry 89*; Nandala Hill, *Berry* (coll. *Damanu*) *101, 102*; vicinity of Nauwanga, south of Nandarivatu, *Degener 14562*; hills between Nggaliwana and Nandala Creeks, south of Nauwanga, *Smith 5832*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 15619* (coll. *Damanu*), *DF 851 (S1425/4)*. TAVEUNI (?): *Seemann 104* (κ).

Dysoxylum aliquantum is very distinct among species of the Fijian Region in its comparatively small flowers and leaves, of which the few leaflets are short-petiolulate and basally attenuate. In flower size it is approached only by *D. gillespieanum*, but in most respects the relationship is not close.

4. *Dysoxylum myriandrum* A. C. Sm. in *Sargentia* 1: 41. 1942, in *Contr. U. S. Nat. Herb.* 30: 515. 1952; J. W. Parham, *Pl. Fiji Isl.* 170. 1964, ed. 2. 243. 1972.

FIGURE 131A & B.

Tree 6–27 m. high, with a trunk up to 60 cm. or more in diameter, found in dense forest and in the forest of ridges at elevations of 575–925 m. The young parts are densely sericeous, the indument being briefly persistent on foliage and inflorescence parts. The leaves are up to 55 cm. in length, with petioles to 17 cm. long and with 9–16 leaflets; petiolules 5–23 mm. long; leaflet blades obovate-oblong, 5.5–18 × 3–9 cm. (lower ones sometimes only 4 × 2.5 cm.), inaequilaterally obtuse at base, obtusely cuspidate at apex, glabrous or with closely appressed hairs on principal nerves of lower surface. The axillary inflorescences are narrowly panicleate, to 15 cm. long, copiously sericeous on exposed parts including calyx and petals; flowers 5-merous, essentially sessile or with the calyx tapered into an apparent pedicel to 2 mm. long; calyx 4–5 mm. long and 5–6 mm. in diameter, with broadly ovate lobes 2–2.5 × 3–4 mm.; petals thick, 9–15 × 3–8 mm.; filament tube 6–10 mm. long, glabrous on both sides or sparsely sericeous without, the anthers 10 (or 14 or 15, perhaps rarely so), 2–2.5 mm. long; disk about 2.5 mm. long, sericeous within; ovary copiously sericeous. The infructescences are axillary; calyx tube accrescent to 6 × 4 mm., the lobes caducous; young fruits ellipsoid, copiously velutinous-tomentellous with short grayish indument. Flowers are known to occur in scattered months, fruits (immature) only in May.

TYPEIFICATION: The species was based on *Smith 569* (NY HOLOTYPE; many ISOTYPES), collected Nov. 21, 1933, on the crest of the Korotini Range between Navitho Pass and Mt. Ndelaikoro, Mathuata–Thakaundrove boundary, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and known only from the two largest islands, apparently with a very limited distribution on each island.

LOCAL NAMES AND USE: The names *mala* and *sasawira* have been noted on Viti Levu, *warokamithi* only from the type collection. The species is sometimes cut as a timber tree in the Nausori Highlands.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Nausori Highlands, *DA 13311, 15612, 15613, DF 787, 1255 (DA L.13805, Ranamu CD-1), 1257 (DA L.13803, Ranamu CD-3), 1258 (DA L.13802, Ranamu CD-4), 1259 (DA L.13801, Ranamu CD-5), Damanu NH-30*. VANUA LEVU: MATHUATA (on Thakaundrove boundary): Summit ridge of Mt. Ndelaikoro, *DA 12799*.

Dysoxylum myriandrum was originally known only from an individual with 14 or 15 anthers, but material now available shows the anthers to be 10 in number, suggesting that the type was aberrant in respect to anther number. The relationship of *D. myriandrum* is with *D. aneityense* Guillaumin, of the New Hebrides, and *D. huntii* Merr., of Samoa, but it differs from both in its substantially larger flowers.

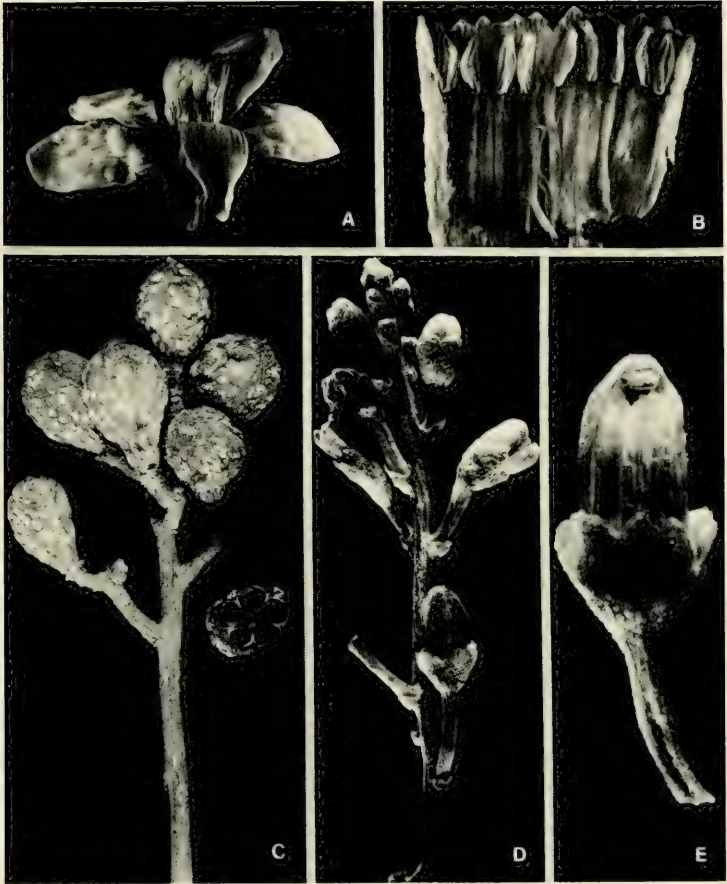


FIGURE 131. A & B, *Dysoxylum myriandrum*; A, flower, $\times 2$; B, inner surface of staminal tube, with 10 anthers, $\times 4$. C, *Dysoxylum lenticellare*; infructescence, one fruit in cross section to show 5 locules, $\times 1$. D & E, *Dysoxylum gillespianum*; D, complete inflorescence, $\times 4$; E, flower with 2 petals removed, showing staminal tube and stigma, $\times 10$. A & B from DA 15612, C from Gillespie 3314, D & E from DA 12870.

5. *Dysoxylum lenticellare* Gillespie in Bishop Mus. Bull. **83**: 13, fig. 14. 1931; A. C. Sm. in Contr. U. S. Nat. Herb. **30**: 507. 1952; J. W. Parham, Pl. Fiji Isl. 170. 1964, ed. 2. 241. 1972.

FIGURE 131C.

Dysoxylum obliquum Gillespie in Bishop Mus. Bull. **83**: 13, p. p., non sensu typi. fig. 15 (solum quoad a-e). 1931.

? *Dysoxylum* aff. *aneityense* sensu A. C. Sm. in Bishop Mus. Bull. **141**: 82. 1936; non Guillaumin. *Didymocheton lenticellare* Harms in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **19b1**: 157. 1940.

Tree 3–25 m. high (rarely noted as a shrub), with a trunk to 65 cm. or more in diameter, occurring in dense, dry, or secondary forest, in the forest-grassland transition, and in crest thickets at elevations of 50–1,150 m., with closely sericeous young parts, the indument fugacious from vegetative parts. The leaves are 15–60 cm. long, with petioles (3–) 7–20 cm. long and with 6–12 (–14) leaflets; petiolules (5–) 10–30 mm. long; leaflet blades oblong or elliptic-oblong (rarely lanceolate), 7–22 × 3–9 cm. (lower ones rarely as small as 4 × 1.5 cm.), inaequilaterally rounded to acute at base, obtusely cuspidate at apex. The axillary inflorescences are paniculate, usually 6–10 cm. long at anthesis, minutely sericeous-strigillose on exposed parts including calyx and petals; flowers 5-merous, essentially sessile; calyx about 2 mm. long and 2–2.5 mm. in diameter, the lobes ovate-suborbicular, about 1 × 1.5 mm.; petals oblong, 5–6 × 1.5–2 mm.; filament tube about 4 mm. long and 3.5 mm. in diameter, glabrous on both sides, the anthers 10, about 1 mm. long; disk 1.3–1.5 mm. long, glabrous on both sides; ovary densely sericeous, with 3–5 locules (usually?) with 2 ovules each. The infructescences, to 15 cm. long, are early completely glabrate; fruits obovoid, 2–3 × 1.5–2 cm., rounded or cuspidate at apex, copiously or sparsely lenticellate. Flowers and fruits have been collected in most months.

TYPIFICATION: The type is a fruiting specimen, *Gillespie 3927* (BISH HOLOTYPE), collected Nov. 21, 1927, on the summit ridge of Mt. Nanggaranambuluta, east of Nandarivatu, Mba Province, Viti Levu. The mixed material included by Gillespie in his *Dysoxylum obliquum* has been discussed above under *Aglaia gracilis*.

DISTRIBUTION: Endemic to Fiji and now known from about 55 collections from six of the high islands, but apparently abundant only on Viti Levu.

LOCAL NAMES AND USE: In addition to the usual names *mala* and *malamala*, this species has been recorded as *kau toa*, *mbau soro*, and *mbau somi*; it is considered a useful timber tree on Viti Levu.

REPRESENTATIVE COLLECTIONS: VITILEVU: MBA: Mt. Evans Range, *Greenwood 949*; summit and upper slopes of Mt. Koromba, *Smith 4691*; Mt. Tomanivi, *Gillespie 4127*. NANDRONGA & NAVOSA: Northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, *Smith 5396*. SERUA: Hills north of Ngaloa, in drainage of Wainingere Creek, *Smith 9175*. NAMOSI: Mt. Naitarandamu, *Gillespie 3314*; Mt. Voma, *DA 1716*. NAITASIRE: Tholo-i-suva, *DA 14601*. TAILEVU: Without further locality, *DA 8718*. REWA: Mt. Korombamba, *DA 16540*. KANDAVU: Vicinity of Lutumatavoro, *DA 14926*. OVALAU: In mountains, *Horne 316*; slopes of Mt. Korotolutolu, west of Thawathi, *Smith 8020*. NGAU: Hills east of Herald Bay, inland from Sawaieke, *Smith 7850*. VANUA LEVU: MBUA: Above Thongea, Wainunu River, *DA 15788*. MATHUATA: Near Saivou, Seangangga River, *Berry 25*. THAKAUNDROVE: Navonu Creek, Natewa Peninsula, *DA 15089*. TAVEUNI: Summit and adjacent slopes of Mt. Manuka, east of Wairiki, *Smith 8229*.

6. *Dysoxylum gillespieanum* A. C. Sm. in Contr. U. S. Nat. Herb. 30: 516. 1952; J. W.

Parham, Pl. Fiji Isl. 170. 1964, ed. 2. 241. 1972; A. C. Sm. in Contr. U. S. Nat. Herb. 37: 72. 1967.

FIGURES 131D & E, 132.

Tree 5–25 m. high, found at elevations of 50–970 m. in dense or dry forest, the young parts copiously strigillose, the indument sometimes subsistent on some foliage parts. The leaves are 14–40 cm. long, with petioles 3–9 cm. long and with 7–11 leaflets; petiolules 7–25 mm. long; leaflet blades elliptic- or lanceolate-oblong, 5.5–22 × 3–8 cm., inaequilaterally rounded or obtuse at base, obtuse to short-acuminate at apex. The inflorescences are borne on branchlets below leaves, very infrequently axillary, sometimes clustered in groups of 2 or 3, compact, simply racemose, not exceeding 3 cm. in length at anthesis, minutely sericeous-strigillose on exposed parts including calyx and petals; flowers 4-merous (as far as observed), 10–15 per inflorescence, with pedicels 1–4 mm. long; calyx about 2 mm. long and 3 mm. in diameter, the lobes broadly ovate; petals at anthesis about 4 × 2 mm.; filament tube glabrous, the anthers 7 or 8, about 0.9 mm. long; disk about 1 mm. long, sericeous-puberulent within; ovary copiously sericeous, the locules 3 or 4, each with 1 or 2 ovules. The infructescences are simple, usually borne on branchlets below leaves; fruits few (usu-

ally only 1 per infructescence), obovoid-ellipsoid, 3.5–4.5 × 1.5–3 cm., rounded at apex, borne on stout pedicels 5–7 mm. long and in diameter, the pericarp thick, woody, essentially elenticellate, the locules 3 or 4, the seeds (if 2) collateral. Flowers have been obtained between October and December, fruits in the same months and also in May and September.

TYPIFICATION: The type, a fruiting specimen, is *Smith 5955* (A HOLOTYPE; ISOTYPES at BISH, K, US), collected Sept. 9, 1947, in hills east of Nandala Creek, about 3 miles south of Nandarivatu, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and known only from the two largest islands; the species has become much better known since the earlier mentions, and all known specimens are cited below.

LOCAL NAMES AND USE: Recorded local names are *mala*, *kaunithina*, *maletawa*, and *sorovulu*; the species is considered a useful timber tree on Viti Levu.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, *Gillespie 4198*. SERUA: Inland from Namboutini, *DA 13717*, *L.23196*, p. p.; inland from Yarawa, *Berry 122*; inland from Ngaloa, *DF 599*; hills between Wainggere and Waisee Creeks, between Ngaloa and Wainiyambia, *Smith 9381*; hills east of Navua River, near Nukusere, *Smith 9105*. NAITASIRE: Waimanu River, *DA 15650*, *L.13339*; near Vatuvula, Waimanu River, *DA 15688*; Tholo-i-suva, *DA L.23196*, p. p. (*DF 132*). VANUA LEVU: MBUA: Near Ndama, *DA 17533*. MATHUATA: Korovuli River, *DA 12870*; Waingili sawmill, vicinity of Lambasa, *DF 821*. FIJI without further locality, *Tohill 98*, *Howard 198*.

The following specimens appear to represent the species; *DF 163* and *Berry 5* have typical mature fruits. All have leaflets suitable for *Dysoxylum gillespieanum* but pilose beneath with spreading pale hairs about 1 mm. long on the costa and secondaries (as sometimes in *Gillespie 4198*, cited above), the indument often extending to the leaflet surface. As a somewhat similar range of indument must be accepted in *D. aliquantum* and *D. myriandrum*, it would appear that this group of *Dysoxyla* is variable in the persistence and extent of foliage indument.

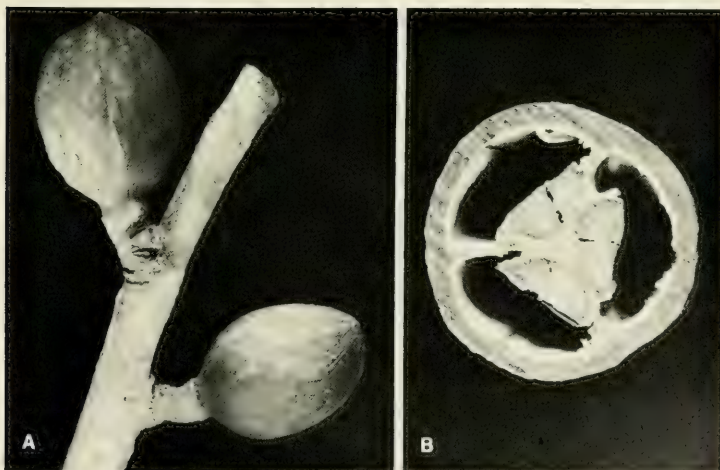
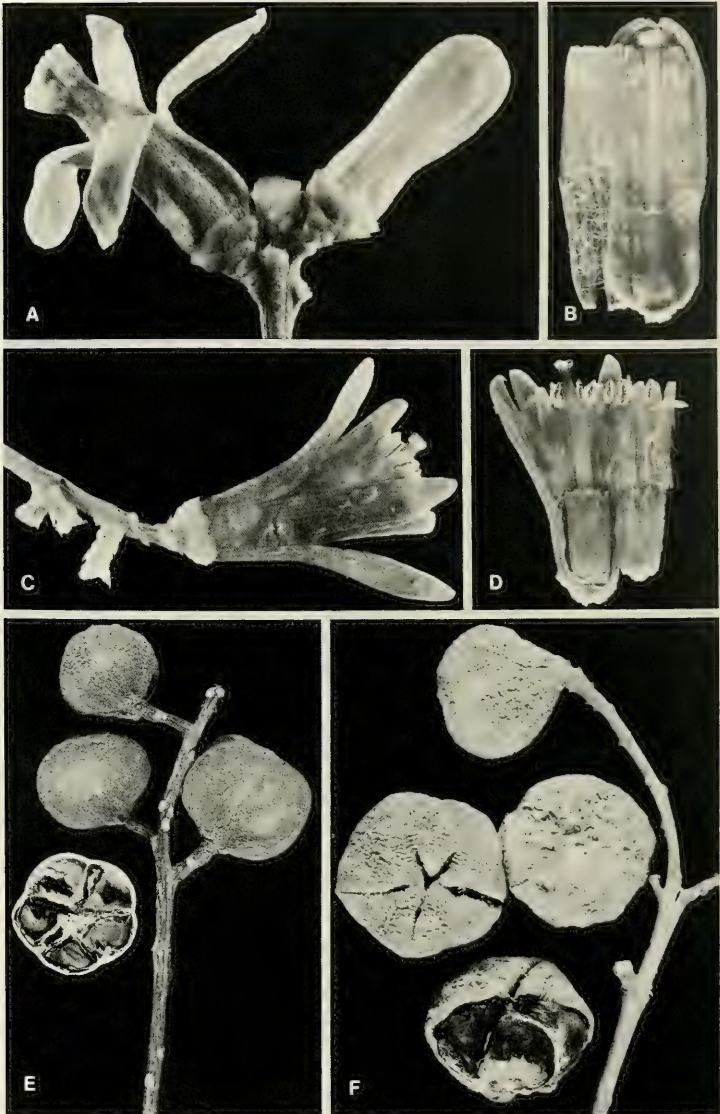


FIGURE 132. *Dysoxylum gillespieanum*, from *Smith 9105*; A, fruits on branchlet below leaves, × 1; B, cross section of fruit, showing 2 collateral seeds in each locule, × 2.



VITI LEVU: NANDRONGA & NAVOSA: Nausori Highlands, DF163, C. G. S. Johns 4. SERUA: Inland from Yarawa, Berry 116; inland from Ngaloa, DF937. VANUA LEVU: THAKAUNDOVE: Navonu Creek, Natewa Peninsula, Berry 5.

Dysoxylum gillespieanum is a species without close allies in the Fijian Region, of the general relationship of *D. lenticellare* but sharply characterized by its simply racemose inflorescences usually borne on branchlets below the leaves, its very small flowers (nearly as small as those of *D. aliquantum*), and its large fruits with a very thick, elenticellate pericarp.

7. *Dysoxylum seemannii* Gillespie in Bishop Mus. Bull. 83: 14, fig. 16, as *D. seemanni*. 1931; A. C. Sm. in Contr. U. S. Nat. Herb. 30: 510. 1952; J. W. Parham, Pl. Fiji Isl. 170, fig. 62, B. 1964, ed. 2. 243, fig. 71, B. 1972. FIGURE 133A & B, E.

Milnea edulis sensu Seem. in Bonplandia 10: 296. 1862; non Roxb.

Aglaiia multijuga Seem. Fl. Vit. 37. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 137. 1890; non *Dysoxylum multijugum* Arn. (1834).

Didymocheton multijugum Harms in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 1961: 157. 1940.

An often slender shrub or tree 1.5–10 m. high, sometimes with foliage and inflorescences congested distally, occurring from near sea level to about 900 m. in dense or open forest or in the forest-grassland transition, the young parts puberulent, soon glabrate. The leaves may attain a length of 130 cm., with petioles (3–) 10–30 cm. long and with (9–) 13–21 leaflets (very rarely 1 or 2 greatly reduced leaflets at or near base of petiole); petiolules 10–40 (terminal to 50) mm. long; leaflet blades oblong to oblong-obovate or lanceolate, 12–30 × 4–11 cm. (lower ones sometimes only 5 × 3 cm.), inaequilaterally attenuate to obtuse at base, obtuse to obtusely acuminate at apex. The inflorescences are narrowly paniculate, many-flowered, 20–130 cm. long, axillary, the rachis, etc., puberulent at anthesis; flowers sessile, 5-merous (infrequently 4-merous), subtended by imbricate bracteoles; sepals 1–2 × 2–3 mm.; petals 12–16 × 1.5–2 mm., copiously strigillose without, distally recurved; filament tube nearly as long as petals, retrorsely pilose without proximally and completely so within, the anthers about 1 mm. long, borne 1.5–2 mm. from apex of tube; disk 4–5 mm. long, glabrous or sparsely pilose without, retrorsely strigose within; ovary copiously pilose, the style copiously antrorsely sericeous. The often ample infructescences, associated with leaves, bear depressed-subglobose fruits 1.5–2 × 2–2.8 mm., copiously velutinous, and inconspicuously 5-lobed or -ridged; seeds at least sometimes 2 per locule. Flowers have been obtained between September and March, fruits between April and November.

TYPEFICTION: *Aglaiia multijuga*, for which *Dysoxylum seemannii* is a substitute name, is typified by *Storck 874* (K HOLOTYPE; ISOTYPE at BM), collected in November, 1860, on the island of Wakaya in Loma-i-Viti.

DISTRIBUTION: Endemic to Fiji and known from more than 40 collections from nine islands, certainly to be expected on many others.

LOCAL NAMES: Recorded names are *tarawau*, *tarawau kei rakaka*, *tavai*, *kau toa*, *ndanindani*, and *ndanindani loa*. The name *ndanindani* is usually firmly attached to araliaceous plants, but *Dysoxylum seemannii* is striking and unusual in its genus, vaguely resembling species of *Polyscias* in foliage.

FIGURE 133. A & B, *Dysoxylum seemannii*: A, ultimate cluster of flowers, the opening one 4-merous, × 4; B, 5-merous flower with calyx and 2 petals removed, showing inner surface of staminal tube (6 anthers remaining), disk surrounding base of gynoecium, style, and stigma, × 4. C & D, *Dysoxylum tenuiflorum*: C, lateral branch of inflorescence, with one flower remaining, × 4; D, flower with 3 calyx lobes and 2 petals removed, showing inner surface of staminal tube with 10 anthers, disk surrounding base of gynoecium, style, and stigma, × 4. E, *Dysoxylum seemannii*; portion of infructescence, with cross section of one fruit, × 1. F, *Dysoxylum tenuiflorum*; portion of infructescence with 3 detached fruits, showing distal, proximal, and lateral surfaces, the last with 2 valves removed to show seeds, × 1. A & B from *Smith 1277*, C & D from *Smith 1247*, E from *Gillespie 2408* (cross sectioned fruit from *Smith 8868*), F from *Bryan 530*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Thorika Creek, Naloto Range, *DA 14782*; vicinity of Nandarivatu, *Gillespie 4301*. NANDRONGA & NAVOSA: Nausori Highlands, *Damanu 58*. NAMOSI: Hills bordering Wainavindrau Creek, vicinity of Wainimakutu, *Smith 8868*. RA: Waindawa, vicinity of Rewasa, near Vaileka, *Degener 15498*. NAITASIRE: Vicinity of Tamavua, *Gillespie 2408*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7068*. REWA: Vicinity of Veisari, *Vaughan 3337*. KANDAVU: Hills above Namalata and Ngaloa Bays, *Smith 160*. VANUA LEVU: MBUA: Upper Ndama River Valley, *Smith 1609*. THAKAUNDROVE: Naunduna, eastern drainage of Yanawai River, *Degener & Ordenez 14109*; track to Mt. Soro Levu, *DA 17146*. TAVEUNI: Nggeleli road, *DA 15861*. MOALA: Near Naro, *Smith 1307*. VANUA MBALAVU: Northern limestone section, *Smith 1509*. MANGO: On edge of limestone forest, *Bryan 564*. KAMBARA: On limestone formation, *Smith 1277*.

8. *Dysoxylum tenuiflorum* A. C. Sm. in *Contr. U. S. Nat. Herb.* 30: 513. 1952; J. W. Parham, *Pl. Fiji Isl.* 171. 1964, ed. 2. 243. 1972. FIGURE 133C & D, F.

Tree 8–20 m. high, occurring in forest from near sea level to about 300 m., the young parts obscurely strigillose, soon glabrate. The leaves are (20–) 25–50 cm. long, with petioles 4–13 cm. long and with (5–) 7–13 leaflets; petiolules 1–6 mm. long (on distal margin, sometimes to 20 mm. long on proximal margin, of terminal leaflet often 20–40 mm. long); leaflet blades ovate- to oblong-elliptic, 9–21 × 4–9.5 cm. (lowest most ones sometimes only 3 × 2 cm.), inaequilaterally acute to rounded at base, obtusely acuminate at apex, usually barbellate in nerve axils beneath. The inflorescences are narrowly or broadly paniculate, 15–40 cm. long, sometimes branched from base and spreading to 20 cm. in breadth; flowers subsessile, 5-merous, subtended by imbricate bracteoles, minutely strigose-puberulent on outer surfaces of sepals and petals; sepals 1–1.7 × 1.3–2 mm.; petals 9–12 mm. long, distally recurved; filament tube nearly as long as petals, glabrous or sparsely strigillose without, glabrous within, the anthers 1–1.2 mm. long, borne in sinuses of apically lobed filament tube and slightly exerted from it; disk 3.5–4.5 mm. long, glabrous without, retrorsely strigillose within; ovary copiously sericeous, the locules 3–5, each with 2 ovules (as far as observed). The fruits are depressed-subglobose, 2–2.5 × 2.5–3 cm., copiously velutinous, 5-ridged or -lobed (as far as noted but presumably sometimes with 3 or 4 locules, etc.), at length dehiscing from apex, the seeds greenish white. Flowers have been obtained in December and March, fruits in September and October.

TYPIIFICATION: The type is *Smith 1247* (NY HOLOTYPE; many ISOTYPES), collected March 2, 1934, in forest on limestone formation on Kambara.

DISTRIBUTION: Endemic to Fiji and known from only four collections, each from a different island.

LOCAL NAMES: Recorded names have been *tarawau tangane* (Taveuni) and *tokai* (Kambara); the latter is usually referred to an orchid.

AVAILABLE COLLECTIONS: KANDAVU: Vicinity of Lomati, *DA 14907* (coll. *I. Qoro*). TAVEUNI: Western slope, between Somosomo and Wairiki, *Smith 717*. LAKEMBA: Northwestern lowland forest, *Bryan 530*.

From its closest relative, *Dysoxylum maota* Reinecke, of Samoa and the Horne and Wallis Islands, *D. tenuiflorum* is distinguished by its fewer leaflets with proportionately broader blades, and by its smaller, more slender, and delicate flowers.

9. *Dysoxylum hornei* Gillespie in *Bishop Mus. Bull.* 83: 12, fig. 13. 1931; A. C. Sm. in *Contr. U. S. Nat. Herb.* 30: 515. 1952.

Didymocheton hornei Harms in *Engl. & Prantl, Nat. Pflanzenfam.* ed. 2. 19b1: 157. 1940.

Slender tree or shrub (1–) 2–15 m. high, found in dense or open forest or in hillside thickets at elevations of 30–1,100 m., the young parts copiously puberulent, the indument often subsistent on some vegetative parts. The leaves are 20–55 cm. long, with petioles 5–16 cm. long and with 5–9 leaflets, these subsessile or with petiolules 1–5 mm. long (on proximal margin, sometimes to 15 mm. long on distal margin, of terminal leaflet sometimes to 55 mm. long); leaflet blades oblong-elliptic to oblanceo-

late, 9–20 × 2.5–9 cm. (lowermost ones sometimes only 4 × 1.5 cm., the terminal one rarely as much as 26 × 12 cm.), acute or obtuse (or terminal one attenuate) at base, obtusely cuspidate or acuminate at apex. The inflorescences are narrowly paniculate,

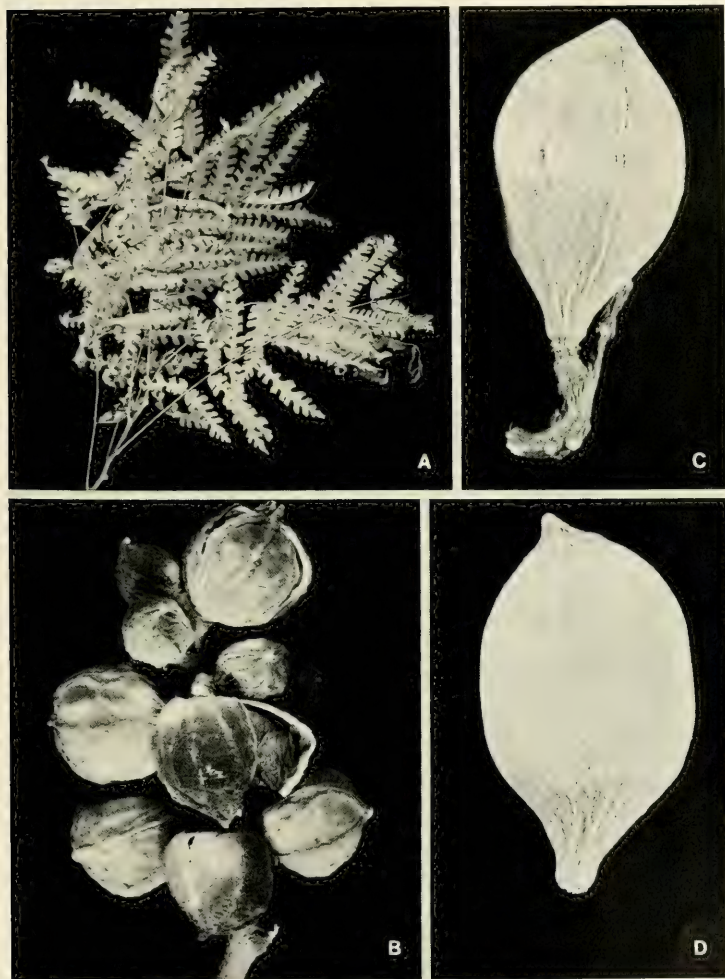


FIGURE 134. A & B, *Dysoxylum hornei* var. *hornei*; A, juvenile foliage, × 1/4; B, portion of infructescence and fruits, some of them showing dehiscence by 3 valves, × 1. C & D, *Dysoxylum hornei* var. *glabratum*; C, 3-valved fruit, × 2; D, 4-valved fruit, × 2. A from Gillespie 4263, B from Gillespie 4212, C & D from Smith 8800.

to 35 cm. long, puberulent or sericeous on exposed surfaces; flowers subsessile, basically 5-merous but with some parts reduced in number, subtended by imbricate bracteoles; sepals suborbicular, 1-1.5 mm. long and broad; petals 3-5, reflexed at anthesis, 5-10 mm. long, sericeous or strigillose to puberulent without; filament tube nearly as long as petals, strigillose without, the anthers 5 or 6 (or 7), 0.7-0.8 mm. long; disk 2-3 mm. long, glabrous or sparsely retrorse-strigillose on both sides; ovary hispidulous-strigillose, 3- or 4-loculed. The infructescences are narrow, the lateral branches short and seldom bearing more than one fruit; fruits ovoid or subglobose to obovoid, 1.5-3.5 × 1.2-2.5 cm., copiously velutinous, rounded to gradually narrowed at base, apiculate or cuspidate at apex, inconspicuously 3- or 4-ridged, the locules 3 or 4. Flowers have been noted between June and March, fruits between April and December.

Two varieties may be maintained in this well-marked species, which differs from *Dysoxylum tenuiflorum* and *D. maota* Reinecke in its smaller flowers, often reduced number of petals, fewer stamens, and leaflet blades with less obviously inaequilateral bases (with the distal half of the blade shorter than the proximal half, the reverse of the usual condition in the genus). It is interesting to note that the juvenile leaflet blades are sometimes deeply sinuate-undulate (FIGURE 134A), a situation also noted in *D. quercifolium* and doubtless to be expected in other species of the genus.

KEY TO VARIETIES

- Leaflet blades persistently hispidulous or at least obviously puberulent on costa beneath, also often pubescent on lower surface; bracteoles and sepals copiously sericeous-strigillose without; petals copiously pilose without, usually 3 or 4, less commonly 5; ovary with hairs 0.5-1 mm. long; fruits predominantly ovoid to subglobose. 9a. var. *hornei*
- Leaflet blades completely glabrate; bracteoles and sepals often glabrous; petals minutely appressed-puberulent without, 5 in number (as thus far noted); ovary with hairs 0.2-0.3 mm. long; fruits predominantly obovoid. 9b. var. *glabratum*

- 9a. *Dysoxylum hornei* var. *hornei*; A. C. Sm. in Contr. U. S. Nat. Herb. 30:515. 1952; J. W. Parham, Pl. Fiji Isl. 170. fig. 62, A. 1964, ed. 2. 241. fig. 71, A. 1972.

FIGURE 134A & B.

The type-including variety, with obvious and persistent indument on the costa and often elsewhere on the lower leaflet blade surfaces; bracteoles, sepals, petals, and ovary obviously and copiously pilose, the petals usually 3 or 4, less commonly 5; fruits predominantly ovoid to subglobose.

TYPIIFICATION: The type is *Gillespie 2863* (BISH HOLOTYPE; ISOTYPES at BISH, GH), collected Sept. 8, 1927 (in fruit), in the vicinity of Namosi Village, Namosi Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and known from three high islands; more than 30 collections are at hand.

LOCAL NAMES AND USES: Names recorded from Viti Levu are *kau toa*, *viviniura*, and *rhautolu*; the leaves are said to have an unspecified medicinal use, and the wood is used locally for timbers and firewood.

REPRESENTATIVE COLLECTIONS: VITI LEVU: Mba: Slopes of Mt. Nairoso, eastern flank of Mt. Evans Range, *Smith 4046*; Naloto Range, *DA 14773*; vicinity of Nandarivatu, *Gillespie 4212*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 11713*; Naruku, vicinity of Mbelo, near Vatukarasa, *Degener 15308*. SERUA: Mbuyombuyo, near Namboutini, *Tabualewa 15610*; hills east of Navua River, near Nukusere, *Smith 9123*. NAMOSI: Mt. Naitarandamu, *Gillespie 3318*. NAITASIRI: Wainamo-Wainisavulevu divide, Wainimala Valley, *St. John 18265*; vicinity of Nasinu, *Gillespie 3587*. KANDAVU: Mt. Mbuke Levu, *DA 2985*. OVALAU: Lovoni Valley, *Horne 233*; vicinity of Levuka, *Horne 375*. FIJI without further locality, *Gillespie 4263*.

9b. *Dysoxylum hornei* var. *glabratum* A. C. Sm. in Contr. U. S. Nat. Herb. **30**: 516. 1952; J. W. Parham, Pl. Fiji Isl. 170. 1964, ed. 2. 241. 1972. FIGURE 134C & D.

Differing from the typical variety in having its leaflet blades completely glabrous; bracteoles and sepals often glabrous; petals and ovary inconspicuously pilose, the petals 5 (as far as noted); fruits predominantly obovoid.

TYPIFICATION: The variety is based on *Degener 14267* (A HOLOTYPE; ISOTYPES at BISH, K, NY, US), collected Feb. 4, 1941, in the vicinity of Nandarivatu, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and known from three of the high islands; all collections known are here cited.

LOCAL NAMES: Recorded names are *ndrengandrenga* (Mba) and *raindambo* (Taveuni).

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, *Gillespie 4220*; hills between Nggaliwana and Nandala Creeks, south of Nauwangga, *Smith 5835*; hills between Nggaliwana and Tumbendreketi Creeks, east of the sawmill at Navai, *Smith 5881*. NAMOSI: Valley of Wainambua Creek, south of Mt. Naitarandamu, *Smith 8800*. NAITASIRE: Vicinity of Nasonggo, *DA 15317*. OVALAU: Hills west of Lovoni Valley, on ridge south of Mt. Korolevu, *Smith 7511*; Lovoni Valley, *Horne 141*. TAVEUNI: Western slope between Somosomo and Wairiki, *Smith 730*.

6. CEDRELA P. Br. Hist. Jam. 158. 1756; L. Syst. Nat. ed. 10. 940. 1759; C. DC. in DC. Monogr. Phan. **1**: 735. 1878; Harms in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **19b1**: 40. 1940; Penn. & Styles in Blumea **22**: 512. 1975; Styles & B. Ramirez in Fl. Neotropica **28**: 360. 1981.

Monoecious trees, deciduous, the indument of simple hairs; leaves usually paripinnate, the leaflet blades entire; inflorescences thyrsoid, freely branched, the flowers 5-merous, functionally unisexual; calyx shallowly or deeply lobed or dentate, often split on 1 or 2 sides; petals free, imbricate, proximally adnate by a median carina to the long, columnar disk (androgynophore); filaments distally free but adnate to androgynophore proximally, the anthers versatile (without pollen in ♀ flowers); ovary 5-locular, borne at apex of gynophore, the ovules 8-14 per locule (vestigial in ♂ flowers), biseriate, the style short, the stigma discoid-capitate; fruit a leathery or woody, septifragal capsule dehiscing from apex by 5 valves, the woody columella 5-angled, with conspicuous scars of seeds, these pendulous from distal part of columella, terminally winged.

LECTOTYPE SPECIES: *Cedrela odorata* L. (vide P. Wilson in N. Amer. Fl. **25**: 291. 1924).

DISTRIBUTION: Neotropical, from Mexico and the West Indies to Argentina, with about eight species (Styles and Ramirez, 1981); Harms (1940) had mentioned the number of described species as about 45. The timber of most species is highly valued. One species has been cultivated in Fiji.

1. *Cedrela odorata* L. Syst. Nat. ed. 10. 940. 1759; C. DC. in DC. Monogr. Phan. **1**: 737. 1878; J. W. Parham in Agr. J. Dept. Agr. Fiji **19**: 99. 1948, Pl. Fiji Isl. 170. 1964, ed. 2. 241. 1972; Styles & B. Ramirez in Fl. Neotropica **28**: 374. fig. 76. E-H. 76a. 1981.

A large tree to 25 m. high (to 35 m. or more where indigenous), with a trunk to 1.5 m. in diameter and with large, blunt buttresses, infrequently cultivated near sea level. The Taveuni specimen cited below was bearing fruits in August.

TYPIFICATION: The species is based on P. Br. Hist. Jam. 158. t. 10, fig. 1. 1756.

DISTRIBUTION: As interpreted by Styles and Ramirez (1981, q. v. for extended synonymy and discussion), *Cedrela odorata* has a broad distribution from Mexico and the West Indies southward to northern Argentina. It was perhaps first introduced into Fiji by J. B. Thurston, who listed it in his 1886 *Catalogue*.

LOCAL NAMES AND USES: Names used in Fiji are *West Indian cedar* and *Spanish cedar*. It is used as a shade tree and is grown as a potential timber tree, although not yet on a commercial scale. It is one of the world's most important hardwoods, now grown on plantations throughout the tropics.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Kalambo, Tholo-i-suva, DA 16415. TAVEUNI: Waiyevo, Smith 8249. The species was growing in the Suva Botanical Gardens in 1948 (Parham), although no voucher is available.

7. KHAYA A. H. L. Juss. in *Mém. Mus. Hist. Nat.* **19**: 249. 1830; C. DC. in DC. *Monogr. Phan.* **1**: 720. 1878; Harms in *Engl. & Prantl, Nat. Pflanzenfam.* ed. 2. **19b1**: 49. 1940; Penn. & Styles in *Blumea* **22**: 515. 1975; Styles in *Fl. Neotropica* **28**: 386. 1981.

Functionally dioecious trees, deciduous; leaves paripinnate, the leaflet blades glabrous, entire; inflorescences axillary, thyrsoid, freely branched, the flowers 4- or 5-merous, functionally unisexual; calyx lobed nearly to base, the lobes imbricate; petals free, contorted in bud, erect; filament tube urceolate to cupuliform, with 8-10 marginal appendages, these imbricate at base, irregularly lobed, the anthers 8-10, borne within apex of filament tube, alternate with appendages (sterile in ♀ flowers); disk in ♂ flowers pulviniform, fused to base of sterile ovary, free from filament tube, in ♀ flowers less conspicuous; ovary 4- or 5-locular, the ovules 12-16 (-18) per locule (vestigial in ♂ flowers), the style short, the stigma thick, discoid, crenulate; fruits capsular, erect, subglobose, woody, septifragal, dehiscing from apex by 4 or 5 (or 6) persistent valves, the columella ridged, with conspicuous seed scars, the seeds 8-18 per locule, orbicular to transversely ellipsoid, narrowly circumalate.

TYPE SPECIES: *Khaya senegalensis* (Desr.) A. H. L. Juss. (*Swietenia senegalensis* Desr.)

DISTRIBUTION: Tropical Africa, the Comoro Islands, and Madagascar, with seven or eight species. *Khaya* is a genus of African mahoganies with valuable timber, of which two species have been introduced into Fiji for experimental cultivation. As only juvenile specimens of these are available, the identifications under which they were introduced are here accepted.

KEY TO SPECIES

- Leaflets usually 3 pairs, the blades broadly lanceolate to obovate- or ovate-lanceolate, about twice as long as broad, often short-cuneate at base, rounded or subtruncate at apex, sometimes minutely apiculate or short-cuspidate; capsules 6-7 cm. in diameter. 1. *K. anthotheca*
 Leaflets usually 3 or 4 pairs, the blades obovate- to lanceolate-oblong, 3-4 times longer than broad, often narrowed at base, usually short-acuminate at apex; capsules 4-6 cm. in diameter.

2. *K. senegalensis*

1. ***Khaya anthotheca*** (Welw.) C. DC. in DC. *Monogr. Phan.* **1**: 721. 1878; Harms in *Engl. & Prantl, Nat. Pflanzenfam.* ed. 2. **19b1**: 53. 1940; J. W. Parham, *Pl. Fiji Isl.* ed. 2. 243. 1972.

Garretia anthotheca Welw. in *Ann. Conselho Ultramar.* **1**: 587. 1858 (repr. *Apont. Phytogeogr. Angola*, 587. 1859).

TYPIFICATION: The species is based on *Welwitsch* (BM HOLOTYPE), from the area of Golungo Alto, Angola.

DISTRIBUTION: Africa from Ghana to Uganda and southward to Angola, in rain forest or deciduous forest.

LOCAL NAMES: *White mahogany* or *smooth-barked African mahogany* (Harms, 1940).

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Kalambo, Tholo-i-suva, DA 16429.

2. ***Khaya senegalensis*** (Desr.) A. H. L. Juss. in Mém. Mus. Hist. Nat. **19**: 250. 1830; Harms in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **19b1**: 51, 53. fig. 4, A-J, 5. 1940; J. W. Parham, Pl. Fiji Isl. ed. 2. 243. 1972.

Swietenia senegalensis Desr. in Lam. Encycl. Méth. Bot. 3: 679. 1792.

TYPEIFICATION: The type is *Roussillon* (P HOLOTYPE in Herb. Lam.), from Senegal.

DISTRIBUTION: Africa from Senegal to eastern Sudan and southward to Uganda, in open country along watercourses.

LOCAL NAME: *Gambian mahogany* (Harms, 1940).

AVAILABLE COLLECTION: VITI LEVU: NAITASIRI: Kalambo, Tholo-i-suva, DA 16425.

8. **SWIETENIA** Jacq. Enum. Syst. Pl. Carib. 4, 20. 1760; C. DC. in DC. Monogr. Phan. **1**: 722. 1878; Blake in J. Wash. Acad. Sci. **10**: 290. 1920; Harms in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **19b1**: 70. 1940; Penn. & Styles in *Blumea* **22**: 521. 1975; Styles in *Fl. Neotropica* **28**: 389. 1981.

Deciduous trees, the wood hard and heavy; leaves usually paripinnate, the leaflet blades glabrous, entire; inflorescences axillary, thyrsoid, short, few-branched, the flowers functionally unisexual; calyx (4 or) 5-lobed about to middle, the lobes obtuse, imbricate; petals (4 or) 5, contorted in bud, becoming reflexed; filament tube cupuliform or urceolate, with 8–10 deltoid appendages, these not imbricate, the anthers 8–10, borne within tube, alternating with appendages, partially exerted (sterile in ♀ flowers); disk in ♂ flowers patelliform, fused to base of filament tube, forming an annulus around ovary, in ♀ flowers less obvious; ovary (4–)5(–6)-locular, the ovules 9–16 per locule (rudimentary in ♂ flowers), the style short-columnar, the stigma discoid; fruit a septifragal capsule, erect, ovoid to obovoid, woody, dehiscent by 5 valves from base or from both base and apex simultaneously, the valves separating into 2 layers, the outer layer woody, the inner thinner, the columella woody, 5-angled, with conspicuous seed scars, the seeds 9–16 per locule, winged at one end and there attached to distal part of columella, the seed body dependent.

TYPE SPECIES: *Swietenia mahagoni* (L.) Jacq. (*Cedrela mahagoni* L.).

DISTRIBUTION: Tropical America from southern Florida, Mexico, and the West Indies to Brazil, with three species (Styles, 1981). Other authors had previously suggested about seven species, but it is known that hybrids can be artificially produced. *Swietenia* provides the true (Spanish) mahogany, and its species are extensively cultivated. Two species have been introduced into Fiji, although at present they are not grown on a commercial scale.

KEY TO SPECIES

Leaves (14–) 16–30 (–40) cm. long, the leaflets (2–) 3–6 (–8) pairs, with blades (8–) 9–13 (–18) × 2.5–4 (–5.5) cm.; calyx lobes and petals ciliolate; capsules 12–15 (–22) cm. long, the seeds 7.5–10 cm. long.

1. *S. macrophylla*

Leaves (10–) 12–15 (–28) cm. long, the leaflets 2–4 (–5) pairs, with blades (4–) 5–6 (–8) × (1.5–) 2.5–3 (–3.25) cm.; calyx lobes and petals not ciliolate; capsules 6–10 cm. long, the seeds 2–5 cm. long.

2. *S. mahagoni*

1. ***Swietenia macrophylla*** King in Hook. Icon. Pl. **16**: pl. 1550. 1886; Blake in J. Wash. Acad. Sci. **10**: 294. 1920; Harms in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **19b1**: 73. 1940; J. W. Parham in Agr. J. Dept. Agr. Fiji **19**: 99. 1948; G. W. Cottle in op. cit. **29**: 19. fig. 1–4. 1959; J. W. Parham, Pl. Fiji Isl. 172. 1964, ed. 2. 244. 1972;

Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 119. 1970; Styles in Fl. Neotropica **28**: 395. fig. 80. 1981.

Tree, cultivated at elevations up to about 250 m. and recorded as 12-34 m. high, but where indigenous occasionally up to 60 m. high and with a trunk to 2 m. in diameter. Flowers have been noted in October, fruits in April and June.

TYPIFICATION: The type is *King s. n.* (K HOLOTYPE), from a plant cultivated in the Calcutta Botanic Garden raised from seeds originally from Honduras.

DISTRIBUTION: America from Vera Cruz southward to Peru, Bolivia, and Brazil (Styles, 1981, *maps 81, 82*), now widely cultivated elsewhere.

LOCAL NAMES AND USES: Names recorded in Fiji are *mahogany*, *large-leaved mahogany*, and *Honduras mahogany*. This species now produces most mahogany available in the commercial market. It was introduced into Fiji in 1911 (Cottle, 1959), and one of the original trees was 34 m. high by 1959, with a girth of 66 cm. The species presumably has high commercial potential in Fiji.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Tholo-i-suva, *DF 602 (S1401/2)*, *Damanu 128*; Forest Reserve, *DF 601 (S1401/1)*; Kalambo, *DA 16412, 16418*; Nasinu, *DA 13799 (DF 264)*, *DF 603 (S1401/3)*, p. p., *604 (S1401/4)*, p. p., *Vesa 4*. TALEVU: Talevu Agricultural Station, *DF 605 (S1401/5)*. Also reported (Parham, 1948) as growing in the Suva Botanical Gardens, but no voucher available.

2. *Swietenia mahagoni* (L.) Jacq. Enum. Syst. Pl. Carib. 20. 1760; C. DC. in DC. Monogr. Phan. **1**: 723. 1878; Blake in J. Wash. Acad. Sci. **10**: 296. 1920; B. E. V. Parham in Agr. J. Dept. Agr. Fiji **10**: 116. 1939; Harms in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **19b1**: 71. fig. 14. 1940; J. W. Parham in Agr. J. Dept. Agr. Fiji **19**: 99. 1948, Pl. Fiji Isl. 172. 1964, ed. 2. 244. 1972; Styles in Fl. Neotropica **28**: 401. fig. 81. 1981.

Cedrela mahagoni L. Syst. Nat. ed. 10. 940. 1759.

As observed in Fiji, *Swietenia mahagoni* is a tree 12-25 m. high, with a trunk up to 1.5 m. in diameter (elsewhere plantation trees up to 30 m. high have been observed), cultivated near sea level. Flowers have been noted in December, fruits between April and August.

TYPIFICATION: The species is typified by Catesby, Nat. Hist. Carolina, ed. 2. **2**: pl. 81. 1754.

DISTRIBUTION: Southern Florida and the Bahamas throughout the West Indies to Trinidad and Tobago (Styles, 1981, *map 83*), now widely grown elsewhere.

LOCAL NAMES AND USES: Names used in Fiji have been *small-leaved mahogany*, *West Indian mahogany*, and *Spanish mahogany*. It is used as a shade tree and street tree, but apparently is not locally considered to have the potential commercial value of *Swietenia macrophylla*. J. W. Parham (1964, 1972) notes that it was probably first planted in Fiji in the old Botanical Gardens on Vanua Mbalavu about 1875; a specimen from that locality is here cited.

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Korotongo, *O. & I. Degener 32120*. NAITASIRE: Viria, *DA 211*; Nasinu Experiment Station, *DA 1542*; Nasinu Approved School, *DF 603 (S1401/3)*, p. p., *604 (S1401/4)*, p. p. TALEVU: Nalovo, *DA 1229*. REWA: Reported (J. W. Parham, 1948) as growing in the Suva Botanical Gardens, but no voucher available. TAVEUNI: Waiyevo, *Smith 8250*. VANUA MBALAVU: Site of Lomaloma Botanical Gardens, *DA 10207*.

9. *Xylocarpus* Koenig in Naturforscher (Halle) **20**: 2. 1784; A. H. L. Juss. in Mém. Mus. Hist. Nat. **19**: 243. 1830; Harms in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **19b1**: 81. 1940; Penn. & Styles in Blumea **22**: 525. 1975.

Trees or shrubs; leaves paripinnate, the leaflets few, the blades glabrous, entire; inflorescences axillary, short, panicle, few- to many-flowered, the flowers 4(or 5)-merous, functionally unisexual; calyx lobed about to middle, the lobes small, valvate; petals contorted in bud, becoming spreading or reflexed; filament tube urceolate to subglobose, with 8 retuse or irregularly lobed appendages at apex, the anthers 8, borne near apex of tube and included, alternate with appendages (sterile in ♀ flowers); disk large, pulviniform, below or fused to ovary but free from filament tube; ovary 4-locular, the ovules (2 or) 3 or 4 (-6) per locule (vestigial in ♂ flowers), the style short-columnar, the stigma discoid; fruit a septifragal capsule, large, pendulous, subglobose, leathery, tardily dehiscent by 4 valves from both base and apex, the columella rudimentary, the septa thin, fragile, the seeds 8-20, large, pyramidal or tetrahedral, with angular margins and flat sides, attached to columella by apices, the outer side more or less rounded, the testa thick, corky, the cotyledons large, fused.

TYPE SPECIES: *Xylocarpus granatum* Koenig.

DISTRIBUTION: Paleotropical and coastal from eastern Africa and Madagascar to Ceylon, Malasia, Australia, Micronesia, Tonga, and Samoa. Three species are usually recognized, two of which are indigenous in Fiji.

Merrill, in his 1917 discussion of Rumphius's Herbarium Amboinense, provided a valuable clarification of the typification, synonymy, and basic characteristics of the two common and widespread species of *Xylocarpus*. They are readily differentiated as noted in the following key, but furthermore *X. granatum* is an often crooked or twisted tree, with smooth, exfoliating bark, whereas *X. moluccensis* usually has a straight trunk and thick, furrowed bark. Throughout its range *X. granatum* is usually associated with mangrove swamps, whereas *X. moluccensis* is found on open coasts. In Fiji this habitat characteristic is not entirely dependable, as *X. granatum* may be found on rocky or sandy shores as well as with mangroves.

KEY TO SPECIES

Leaflets 4 (or 2, rarely 6), the petiolules (2-) 3-10 mm. long, the blades coriaceous, oblong to obovate, (4-) 6-14 × (2-) 3-8 cm., usually broadest at or above middle, slightly narrowed and inaequilaterally acute at base, rounded to obtuse at apex; inflorescences 2.5-7 cm. long; fruits 10-25 cm. in diameter at maturity.

1. *X. granatum*

Leaflets 4-8, the petiolules (on shorter edge) less than 3 mm. long, the blades chartaceous to thin-coriaceous, ovate, 6-13 × 4-8 cm., usually broadest below middle, rounded to an abruptly subacute base, obtuse to bluntly acuminate at apex; inflorescences 6-15 cm. long; fruits 7-12 cm. in diameter at maturity.

2. *X. moluccensis*

1. ***Xylocarpus granatum*** Koenig in *Naturforscher* (Halle) **20**: 2. 1784; Merr. Interpret. Rumph. Herb. Amb. 306. 1917; Harms in Engl. & Prantl, *Nat. Pflanzenfam.* ed. 2. **19b1**: 84. fig. 19, A-C. 1940; A. C. Sm. in *Contr. U. S. Nat. Herb.* **30**: 470. 1952; Yuncker in *Bishop Mus. Bull.* **220**: 156. 1959; J. W. Parham, *Pl. Fiji Isl.* 172. 1964, ed. 2. 244. 1972; Penn. & Styles in *Blumea* **22**: 526. fig. 16, g, h. 1975.

FIGURES 135A-C, 136.

Carapa obovata Bl. *Bijdr. Fl. Ned. Ind.* 179. 1825; Seem. *Fl. Vit.* 38. 1865; Drake, *Ill. Fl. Ins. Mar. Pac.* 137. 1890; Guillaumin in *J. Arnold Arb.* **12**: 238. 1931.

Xylocarpus obovatus A. H. L. Juss. in *Mém. Mus. Hist. Nat.* **19**: 244. 1830; A. Gray, *Bot. U. S. Expl. Exped.* **1**: 243. 1854; Seem. in *Bonplandia* **9**: 254. 1861, *Viti*, 434. 1862.

Tree 6-15 m. high (to 20 m. elsewhere), often with spreading branches, occurring frequently on the inner edges of mangrove swamps but also on rocky beaches and riversides, in coastal thickets, and in littoral forest to a slight elevation of 20 m. or somewhat more. The petals are pale green to white or yellowish white, the staminal tube is white and often pink-tinged, and the fruits are green, the large seeds with salmon-pink sarcotestas. Flowers have been noted between September and April, fruits between February and October.



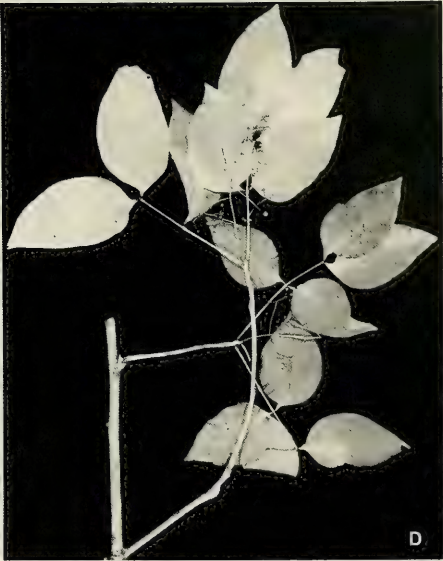
A



C



B



D

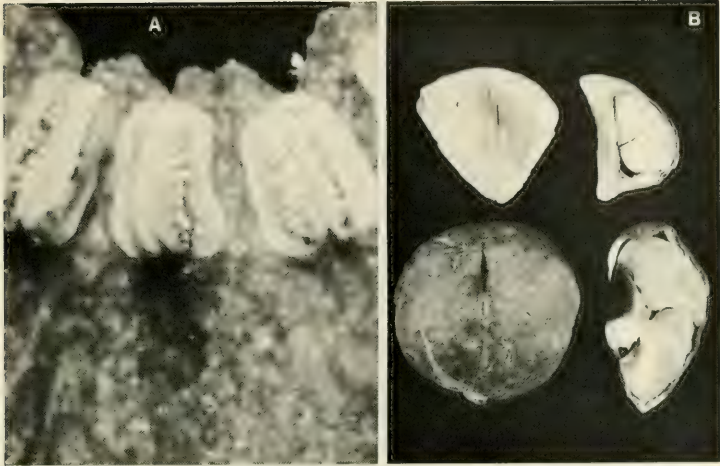


FIGURE 136. *Xylocarpus granatum*; A, distal part of staminal tube and three anthers, $\times 30$; B, fruit and seeds, $\times 1/2$. A from DA 13602, B: whole fruit from Smith 181, 3 seeds in fruit valve from Bryan 418, free seeds (1 cut to show corky testa and included cotyledons) from Parks 20933.

TYPIFICATION: The species was based on a Koenig specimen from the Tranquebar coast of India, although a reference to Rumphius was also listed, noted by Merrill (1917) as *Granatum litoreum* III *parvifolium* Rumph. Herb. Amb. 3: 93. t. 61. 1743. *Carapa obovata* was presumably based on a Blume collection noted as “. . . ad littora insularum Javae, Nusae Kambangae, et Nusae-Laut.”

DISTRIBUTION: India and Ceylon through Malesia to the Carolines and Tonga. About 25 Fijian collections from eight islands are at hand, but the species is more frequent than this suggests.

LOCAL NAMES AND USES: *Ndambi*, *puzzle nut*, *lengilengi*, the last, from southern Lau, being suggestive of the Tongan name for the species, *lekileki*. To a limited extent the wood is used for boat-building and to provide timbers, and the species is said to have unspecified medicinal uses.

REPRESENTATIVE COLLECTIONS: VITI LEVU: SERUA: Flat coastal strip in vicinity of Ngaloa, Smith 9679. NAMOSI: Banks of Lombau River, Damani 41. TAILEVU: Ngelekuro, DA 13602; Tombuninggio, DA 10062. REWA: Near Suva, MacDaniels 1003; Tathi, Notho Tikina, DA 1053. VITI LEVU without further locality, Parks 20933. KANDAVU: Namalata isthmus region, Smith 181. KORO: East coast, Smith 1101. VANUA LEVU: MBUA: Between Mbua and Wailevu, DA 2662. MATHUATA: Vicinity of Lambasa, Greenwood 622. THAKAUNDROVE: Ndromoninuku, DA 16815. TAVEUNI: Seemann 62. LAKEMBA: Near Nukunuku Village, Garnock-Jones 800. FULANGA: On limestone formation, Smith 1168. ONGEA NDRIKI: On rocky beach, Bryan 418. FLJI without further locality, U. S. Expl. Exped.

FIGURE 135. A-C, *Xylocarpus granatum*; A, distal portion of branchlet, with foliage and inflorescences, $\times 1/4$; B, ultimate cluster of functionally σ flowers, $\times 2$; C, σ flower with staminal tube removed, $\times 4$. D, *Xylocarpus moluccensis*: distal portion of branchlet, with foliage and inflorescences, $\times 1/4$. A-C from DA 13602, D from Smith 1398.

2. *Xylocarpus moluccensis* (Lam.) M. Roem. Fam. Nat. Syn. Monogr. 1: 124. 1846; Merr. Interpret. Rumph. Herb. Amb. 307. 1917; Christophersen in Bishop Mus. Bull. 128: 114. 1935; Harms in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19b1: 84. fig. 19, D-M. 1940; A. C. Sm. in Contr. U. S. Nat. Herb. 30: 470. 1952; Yuncker in Bishop Mus. Bull. 220: 156. 1959; J. W. Parham, Pl. Fiji Isl. 172. 1964, ed. 2. 244. 1972; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 65. 1972. FIGURE 135D.

Carapa moluccensis Lam. Encycl. Méth. Bot. 1: 621, quoad descr., excl. Rumph. t. 61. 1785; Seem. Fl. Vit. 38. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 137. 1890.

Xylocarpus granatum sensu A. Gray, Bot. U. S. Expl. Exped. 1: 243. 1854; Seem. in Bonplandia 9: 254. 1861, Viti, 434. 1862; non Koenig.

An often spreading tree 2-11 m. high (to 30 m. elsewhere), occurring near sea level on rocky or sandy beaches, in coastal forest, and along rivers and on riverine islands. The fragrant flowers have cream-white to yellow petals, and the fruit at length becomes brown. Flowers have been obtained between March and August and fruits only in December, but data are limited.

TYPEIFICATION: Lamarck's description of *Carapa moluccensis* was compiled from *Granatum litoreum* I *latifolium* Rumph. Herb. Amb. 3: 92. t. 62. 1743 (Merrill, 1917).

DISTRIBUTION: Madagascar to India and eastward through Malesia to the Mariana Islands, Tonga, and Samoa. In Fiji this species is less frequently collected than the preceding.

LOCAL NAMES: *Ndambi* is applied to either Fijian species of *Xylocarpus*; otherwise *X. moluccensis* has been noted as *lengilengi* (Tailevu) and *mbolavatu* (Vanua Mbalavu).

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vatia Point, DA 15274. TAILEVU: Matavatathou, DA 15366. MBENGA: Malambi, Weiner 226. VANUA LEVU: MATHUATA: Nambekavu Island, near Ndreketi River, DA 16953; islands off Mathuata coast, Greenwood 683. MOALA: Rocky shore, north coast, Smith 1398. VANUA MBALAVU: Vicinity of Sawana Village, Garnock-Jones 1061, 1072. THIKOMBIA-I-LAU: On sandy shore, Tothill 66. KOMO: On sand beach, Bryan 493. ONGEA NDRIKI: On rocky beach, Bryan 417. FIJI without further locality, U. S. Expl. Exped., Seemann 61.

FAMILY 139. ZYGOPHYLLACEAE

ZYGOPHYLLACEAE R. Br. in Flinders, Voy. Terra Australis 2: 545, as *Zygyphyllaeae*. 1814.

Shrubs, small trees, or herbs, usually with well-developed, paired stipules, these slender, persistent, sometimes spinescent, rarely lacking; leaves opposite, infrequently alternate, usually paripinnate but varying; inflorescences terminal or pseudoaxillary, usually cymose, rarely racemose or 1-flowered, the flowers usually ♂, actinomorphic, and hypogynous, (3-)-5(-6)-merous; sepals distinct or rarely basally connate, imbricate or valvate; petals usually free, imbricate or convolute, rarely valvate, sometimes lacking; stamens (1-)-2 (-3) times as many as petals, the filaments free, often with lingular basal appendages, the anthers 2-celled, dorsifixed, dehiscing by longitudinal slits; disk intrastaminal, usually well developed; ovary (2-)-4- or 5(-12)-locular, the placentation axile, the ovules 1-many per locule, pendulous, anatropous to orthotropous, usually epitropous, the style often slender (rarely divided), the stigma capitate or stigmas free; fruit usually a loculicidal or septicidal capsule or a schizocarp, infrequently a berry or drupe, the seeds 1-many, with straight or curved embryos, the endosperm copious or lacking.

DISTRIBUTION: Pantropical and subtropical, extending into temperate areas, often occurring in dry or saline habitats, with about 30 genera and 250 species. One genus has been noted in Fiji.

1. **TRIBULUS** L. Sp. Pl. 386. 1753; Engl. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **19a:** 174. 1931; van Steenis in Fl. Males. I. **4:** 64. 1949; Backer & Bakh. f. Fl. Java **1:** 242. 1963; Hutchinson, Gen. Fl. Pl. **2:** 618. 1967.

Herbs with long taproots, annual or perennial, prostrate to erect, often sericeous-pilose; leaves opposite, paripinnate, usually anisophyllous; flowers pseudoaxillary, solitary or in several-flowered dichasia, 5-merous; sepals free, imbricate; petals obovate, imbricate, becoming spreading, fugacious; stamens 10; disk urceolate, 10-lobed; ovary 5(-12)-locular, the ovules 3 or more per locule, uniseriate, the style short, the stigmas separate, decurrent; fruits angled or winged, the cocci usually 5 or fewer, spinose or tuberculate, each with 3-5 seeds separated by septa.

LECTOTYPE SPECIES: *Tribulus terrestris* L., one of Linnaeus's four original species (vide Vail & Rydberg in N. Amer. Fl. **25:** 109. 1910).

DISTRIBUTION: Pantropical, subtropical, and warm temperate, with about 20 species, best developed in dry parts of Africa and Australia. One species, apparently rare as an adventive, has been recorded in Fiji.

1. **Tribulus terrestris** L. Sp. Pl. 387. 1753; B. E. V. Parham in Agr. J. Dept. Agr. Fiji **11:** 51. 1940; Greenwood in J. Arnold Arb. **36:** 398. 1955; J. W. Parham, Pl. Fiji Isl. **122.** 1964, ed. 2. 174. 1972.

An infrequent weed in pastures, prostrate, annual or biennial, the leaves to 4 cm. long, with 3-5 pairs of leaflets, these with oblong blades up to 10 × 5 mm.; flowers solitary, about 1 cm. in diameter on pedicels up to 1.5 cm. long, the petals yellow, the fruits with cocci bearing 2 large spines and a few smaller ones.

TYPIFICATION: Linnaeus cited a number of references and added: "*Habitat in Europa australi ad semitas.*"

DISTRIBUTION: Indigenous in southern Europe and adjacent areas and now occasional as an adventive in other areas, in the Pacific in Hawaii (sparsely) and Australia. The Fijian record is based on the mention by B. E. V. Parham (1940), who implied that the plant was a pasture weed causing photosensitization in cattle. No Fijian specimens are available, and conceivably the species has been eradicated. Greenwood (1955) had never heard of its collection in Fiji and suggested that *Tribulus cistoides* is more to be anticipated there. The latter species has a widespread but spotty indigenous Pacific distribution, being locally abundant on sandy beaches in equatorial islands and Hawaii; although it is recorded from eastern Polynesia, New Caledonia, New Guinea, the Marshall Islands, and Queensland, I find no record of it from the Fijian Region. In the absence of Fijian collections the record of *T. terrestris* cannot be verified, but the pasture habitat and the apparent absence of *T. cistoides* from coastal habitats suggest that Parham's identification of the plant was probably correct. *Tribulus cistoides* is readily distinguished from *T. terrestris* by its perennial habit, larger leaves (to 7.5 cm. long, with 4-8 pairs of leaflets with blades up to 22 × 9 mm.), and larger flowers (2.5-4 cm. in diameter, with pedicels 2-4 cm. long).

ORDER SAPINDALES

Of the 13 families referred to the order Sapindales by Takhtajan (1980), only the Sapindaceae have representatives in Fiji.

FAMILY 140. SAPINDACEAE

SAPINDACEAE Juss. Gen. Pl. 246, as *Sapindi*. 1789.

Trees, shrubs, or woody (infrequently herbaceous) vines (then tendrillous), often dioecious or monoecious, sometimes polygamodioecious or polygamomonocious, stipulate or stipules rarely present and small; leaves alternate or rarely opposite, usually pinnately (or bipinnately) compound or trifoliolate, rarely simple; inflorescences terminal or axillary, sometimes borne on stems or branchlets, usually cymose or cymose-paniculate; flowers ♂ or more often functionally unisexual, hypogynous, usually slightly zygomorphic, sometimes actinomorphic, often small, predominantly 4- or 5-merous; calyx composed of distinct sepals or these connate proximally, the sepals or calyx lobes imbricate, rarely valvate; petals free, imbricate, often clawed, often with scalelike appendages within toward base, infrequently lacking; disk commonly extrastaminal, annular, often unilateral, rarely minute and intrastaminal; stamens usually 4-10 (rarely more), often 8, usually 1-seriate, the filaments free, often pilose, the anthers 2-celled, dehiscent by longitudinal slits (sterile in ♀ flowers); gynoecium composed of 2-6 (usually 3) carpels united into a compound, usually several-locular ovary, rarely with incomplete septa (rudimentary in ♂ flowers), the placentation mostly axile, the ovules 1 or 2 per locule, anatropous to campylotropous, ascending to pendulous, the style terminal, often lobed or cleft, or styles distinct; fruit diverse, a capsule, berry, drupe, nut, schizocarp, or samara, the seeds often with an aril or sarcotesta, the embryo curved, the endosperm lacking, the cotyledons often plicate or twisted.

DISTRIBUTION: Pantropical and subtropical, infrequently extending into temperate areas, with 140-150 genera and 1,500-2,000 species. Many species provide edible fruits, ornamentals, or valuable timber. Fifteen genera are known to occur in Fiji, 13 with indigenous species and two only in cultivation.

USEFUL TREATMENTS OF FAMILY: RADLKOEFER, L. Sapindaceae. Pflanzenr. 98 (IV. 165): 1-1539. 1931-1934. Backer, C. A., & R. C. Bakhuizen van den Brink, Jr. Sapindaceae. Fl. Java 2: 130-143. 1965. REYNOLDS, S. T. Sapindaceae. In: Stanley, T. D., & E. M. Ross. Flora of south-eastern Queensland 1: 494-522. 1983.

Radlkofer's monumental work, published posthumously, is the only comprehensive treatment of this large, taxonomically difficult family. Although his keys to genera and species are admittedly not always satisfactory, the recognized genera that occur in the Pacific seem well demarcated. The treatment is often criticized, but it must serve as a starting point until such time as another equally gifted taxonomist provides a new worldwide study, at least at the generic level, hopefully utilizing newer techniques. For the time being, many of the genera seem intractable on any but a very local basis.

The other treatments listed above are valuable for their keys and generic descriptions. Backer and Bakhuizen van den Brink (1965) include all but three of the genera occurring in Fiji. Reynolds (1983) includes nine of the genera that are indigenous in Fiji.

KEY TO GENERA

Ovule 1 per locule, apotropous, erect or ascending.

Leaves imparipinnate (usually 3-foliolate or biternate); flowers zygomorphic, the disk unilateral; seeds exarillate.

Inflorescences 3-branched, with 2 circinnate tendrils near apex of the long peduncle; ovary 3-locular; capsule inflated, 3-lobed; scrambling or climbing vines, the leaves biternate.

1. *Cardiospermum*

- Inflorescences cymose-racemiform, simple or branched, without tendrils; ovary usually 2-locular; fruit a juicy schizocarp, with 1 or 2 (or 3) nutlets; small trees or shrubs, the leaves ternate (rarely 1- or 5-foliolate but not in our species). 2. *Allophylus*
- Leaves paripinnate (leaflets alternate or opposite but leaves lacking a true terminal leaflet); flowers (at least in our species) essentially actinomorphic, the disk annular.
- Fruits divided into indehiscent or irregularly splitting mericarps or nutlets (often only 1 maturing) without valves.
- Seeds exarillate; fruit a fleshy schizocarp, with 1 or 2 subglobose mericarps; petals present, squamate. 3. *Sapindus*
- Seeds arillate.
- Mericarps (usually only 1 developing) tuberculate, indehiscent; aril carnose, entirely enveloping seed; petals lacking; in Fiji cultivated only. 4. *Litchi*
- Mericarps smooth or rough but not tuberculate; aril partially enveloping seed or basal; indigenous.
- Petioles short, the lowest pair of leaflets reduced in size and sometimes stipuliform; petals 5, equisquate; stamens 5; mericarps (usually only 1 developing) with a smooth pericarp. 5. *Pometia*
- Petioles obvious, the lowest pair of leaflets not significantly reduced in size; petals lacking in our species; stamens 8 in our species; mericarps (1 or 2 developing) with a rough pericarp. 6. *Alectryon*
- Fruits capsular, loculicidally dehiscent into valves.
- Petals with cristate scales, short-clawed; calyx of 5 broadly imbricate, nearly free sepals, these unequal, suborbicular; stamens with pilose filaments; ovary acutely trigonous; inflorescences paniculiform; fruit (1- or) 2- or 3-valved, the lobes laterally flattened and winglike, usually compressed and with thickened margins, glabrous on both surfaces, the aril nearly complete, thin, somewhat extended and appendaged distally. 7. *Guioa*
- Petals with ecristate scales; fruits globose to obovoid-trigonous, 2- or 3-valved but the lobes not winglike although sometimes laterally flattened, copiously pilose within (at least in our species).
- Inflorescences paniculate or infrequently racemose (but not compactly so), usually freely branched; stamens (of our species) with pilose filaments; ovary subglobose to trigonous-ovoid.
- Calyx opening early, with 5 valvate or narrowly imbricate lobes, these not membranaceous at margin; petals short-clawed; style obvious; fruits 2- or 3-locular, the septa (in our species) complete; seeds with aril (in our species) nearly complete, narrowed at base and attached by a narrow ring around hilum and micropyle. 8. *Arytera*
- Calyx opening late, with 5 nearly free lobes, these broadly imbricate, 2-seriate, membranaceous at margin; petals sessile; style short; fruit in our species either 1-locular and 1-seeded with negligible septa or 3-locular and 3-seeded with incomplete or complete septa; seeds with aril partial or nearly complete, rounded at base and attached by a broad ring around hilum and micropyle. 9. *Cupaniopsis*
- Inflorescences racemose or paniculate with racemiform branches, the flowers compactly arranged in bud; calyx deeply 5-lobed, the lobes narrowly imbricate, soon spreading; petals clawed; ovary trigonous-ovoid, 3-locular; fruit 3-locular, the seeds with a lobed aril attached by a rounded base. 10. *Elattostachys*
- Ovules mostly 2 per locule, apotropous and erect or epitropous and dependent (in the latter case sometimes solitary, cf. genera 14 and 15); seeds (in our species) exarillate or with aril represented by a minute, annular sarcotesta.
- Leaves imparipinnate (at least in our species), with a single terminal leaflet, or simple; ovules 2 per locule.
- Flowers asymmetric; petals present; disk obvious; fruits inflated but not winged; leaves compound, the leaflet blades not conspicuously glandular-punctate or viscid.
- Leaves in our species bipinnate and ample, the rachises not winged, the leaflets on major leaf divisions (in our species) 8-17; petals squamate; disk slightly oblique; filaments villose. 11. *Koelreuteria*
- Leaves pinnate, with (in our species) 5 or 7 leaflets, the rachis narrowly winged; petals squamate; disk (in our species) conspicuously unilateral; filaments glabrous; indument composed of 2 types of stellate hairs (sessile or stipitate). 12. *Cossignia*
- Flowers actinomorphic; petals lacking; disk small or obsolete; fruit with 2 or 3 longitudinal, veined wings; leaves (in our species) simple, with glandular-punctate and often viscid blades. 13. *Dodonaea*
- Leaves paripinnate, lacking a true terminal leaflet; ovule (in our representatives) 1 per locule.
- Fruit a 1- or 2-locular drupe; leaf rachis winged; in Fiji cultivated only. 14. *Filicium*
- Fruit a loculicidally dehiscent capsule; leaf rachis not winged; indigenous. 15. *Harpullia*

Radlkofer's generic sequence is in general followed in the preceding key, but the genera known to occur in Fiji may be more superficially recognized by obvious foliage and fruit characters. In the following simplified key the choices reflect only characters seen in taxa in Fiji, not the entire variability of the genera.

SUPERFICIAL KEY TO GENERA

- Cultivated genera; leaves paripinnate.
 Leaf rachis unwinged; fruit tuberculate; seed with edible aril. 4. *Litchi*
 Leaf rachis winged; fruit smooth; seed exarillate. 14. *Filicium*
 Genera with indigenous species.
 Leaves simple; fruit with longitudinal, veined wings. 13. *Dodonaea*
 Leaves bipinnate. 11. *Koelreuteria*
 Leaves biternate; tendrillous, scrambling or climbing vines. 1. *Cardiospermum*
 Leaves ternate. 2. *Allophylus*
 Leaves imparipinnate, the rachis narrowly winged; indument copious, composed of sessile and stipitate stellate hairs. 12. *Cossignia*
 Leaves paripinnate; indument comparatively inconspicuous.
 Lowermost pair of leaflets reduced in size and auricle-like, sometimes stipuliform. . . . 5. *Pometia*
 Lowermost pair of leaflets not significantly reduced in size.
 Leaf rachis with sharp, abaxially projecting angles; fruit mericarps tardily and irregularly splitting. 6. *Alectryon*
 Leaf rachis without sharp angles or wings.
 Fruit a schizocarp with indehiscent mericarps; seed exarillate. 3. *Sapindus*
 Fruit with inflated, rounded, loculicidally dehiscent lobes; seed with a minute, scarcely apparent, basal aril. 15. *Harpullia*
 Fruit capsular, loculicidally dehiscent into valves; seed with an obvious aril.
 Fruit lobes laterally flattened and winglike, with thickened margins, glabrous within. 7. *Guioa*
 Fruit lobes not winglike, copiously pilose within.
 Lower leaflet surfaces, inflorescence branches, capsules, etc., with minute peltate scales; aril narrowed at base. 8. *Arytera*
 Lower leaflet surfaces, etc., without peltate scales or these very sparse and evanescent; aril rounded at base.
 Leaflet blades ovate to elliptic or oblong, 2-3 times longer than broad; septa of fruit sometimes incomplete, usually not obvious at full maturity. 9. *Cupaniopsis*
 Leaflet blades lanceolate to ovate- or oblong-lanceolate, 3-5 times longer than broad; septa of fruit complete, separating but obvious at full maturity. 10. *Elatostachys*

1. *CARDIOSPERMUM* L. Sp. Pl. 366. 1753; Seem. Fl. Vit. 45. 1865; Radlk. in Pflanzenr. 98 (IV. 165): 370. 1932.

Monoecious vines climbing by means of circinnate tendrils borne near apices of long inflorescence peduncles, the leaves distant, usually biternate, the leaflets pinnatilobed-pinnatifid, with chartaceous blades; inflorescences axillary, with 3 short, few-flowered branches, the flowers zygomorphic, unisexual, in our species with 4 broadly imbricate sepals and 4 squamate petals; disk unilateral, usually composed of 2 glands; stamens 8, unilateral, the filaments pilose, the anthers sterile in ♀ flowers; ovary in ♀ flowers 3-locular (lacking or rudimentary in ♂ flowers), each locule with 1 ascending ovule, the style short, with 3 linear stigmatic branches; fruit a membranaceous, obviously nerved, inflated, 3-lobed capsule, septicidally dehiscent, the 3 seeds subglobose, blackish.

TYPE SPECIES: *Cardiospermum halicacabum* L.

DISTRIBUTION: About 14 species in tropical America, two or three of them extending into other warm regions.

1. *Cardiospermum halicacabum* L. Sp. Pl. 366. 1753; Benth in London J. Bot. 2: 213. 1843; Seem. Fl. Vit. 45. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 142. 1890; Radlk. in Pflanzenr. 98 (IV. 165): 379. fig. 8, A-C. 1932; Yuncker in Bishop Mus. Bull. 220: 173. 1959; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 186. 1970.

Cardiospermum microcarpum H. B. K. Nova Gen. et Sp. 5: 104. 1821; A. Gray, Bot. U. S. Expl. Exped. 1: 247. 1854; Seem. in Bonplandia 9: 254. 1861, Viti, 434. 1862; Greenwood in Proc. Linn. Soc. 154: 96. 1943.

Cardiospermum halicacabum var. *microcarpum* Bl. Rumphia 3: 185. 1849; Radlk. in Pflanzenr. 98 (IV. 165): 387. 1932; J. W. Parham, Pl. Fiji Isl. 173. 1964, ed. 2. 245. 1972.

In Fiji this widespread species occurs from near sea level to about 200 m. as a scrambling, creeping, or climbing vine, occasional in thickets and grassy areas and also as a weed of cultivation in canefields and coconut plantations. Its fragrant flowers have white petals and the fruit is green, the seeds becoming black. Flowers and fruits are most frequently seen between August and January.

TYPEFICTION AND NOMENCLATURE: Linnaeus listed several earlier references, among which I have not noted a lectotypification. *Cardiospermum microcarpum* is typified by Humboldt and Bonpland material collected near San Fernando de Atabapo, Venezuela. Radlkofer combined many names in his complex synonymy, retaining only var. *microcarpum* as an infraspecific taxon. Most Pacific specimens seem to fall into this, but the distinctions between it and the typical variety, if both are maintained, seem too vague to be useful.

DISTRIBUTION: The species occurs in practically all tropical and subtropical regions. In Fiji it may be anticipated on most islands, although only about 25 collections have been noted.

LOCAL NAMES: *Wa niu; vo niu; balloon vine.*

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Lautoka, Greenwood 69. RA: Yanggara, Greenwood 69A; Pasture Seed and Production Farm, Ndombuilevu, DA 7870. REWA: Suva, DA 11858 (L.6419); Nukulau Island, Barclay 3464. OVALAU: Milne 243. WAKAYA: Tothill 82. NGAU: Milne 151. TAVEUNI: Waitavala Estate, DA 11515. MATUKU: Moseley s. n. MANGO: Bryan 562. FIJI without further locality, U. S. Expl. Exped., Seemann 65.

Although *Cardiospermum halicacabum* often gives the appearance of being a weed, it is presumably a facultatively dispersed plant to be considered indigenous throughout most of its range.

2. *ALLOPHYLUS* L. Sp. Pl. 348. 1753; Radlk. in Pflanzenr. 98 (IV. 165): 455. 1932; Leenh. in Blumea 15: 301. 1968.

Monoecious or dioecious shrubs or small trees (sometimes scrambling), the leaves spirally arranged, 3-foliolate (infrequently 1- or 5-foliolate), the leaflet blades chartaceous and mostly serrate or crenulate; inflorescences axillary, cymose-racemiform, simple or branched, the flowers zygomorphic, the pedicels articulate at base; sepals 4, broadly imbricate in unequal pairs, persistent; petals 4, unilateral, with a bifid scale at base within; disk small, unilateral, 4-lobed; stamens 8 (staminodial in ♀ flowers), the anthers introrse; ovary in ♀ flowers 2 (or 3)-lobed (reduced to a petal-opposed pistilode in ♂ flowers), each locule with 1 ascending ovule, the style 2 (or 3)-branched; fruit a juicy schizocarp with 1 or 2 (or 3) nutlets, the seeds exarillate.

TYPE SPECIES: *Allophylus zeylanicus* L., the only original species. Apparently Leenhouts (1968, p. 313) was the first formally to combine this name with *A. cobbe* (L.) Raesch., adopting the latter specific epithet. Since both epithets date from Linnaeus's 1753 work, *A. cobbe* should be utilized by those botanists who accept Leenhouts's combination of the taxa.

DISTRIBUTION: Tropical and subtropical, with a number of species between one and about 200, depending upon the eye of the beholder and whether or not he wishes to recognize the spatial and morphological discontinuities that exist in nature. It seems unlikely that students of local floras will adopt the viewpoint of Leenhouts (for example, see the meticulous treatment of the genus by Fouillouy and Hallé in Aubréville & Leroy, Fl. Cameroun 16: 20-28. 1973). On a regional basis I prefer to recognize two

species in Fiji. Malesian specimens of *Allophylus cobbe* have comparatively large leaflets, these often lanceolate and subentire, the inflorescence simple to few-branched, with comparatively elongate branches; these specimens seem reasonably distinct from the Malesian-Pacific material passing as *A. timoriensis*. Leenhouts's conclusions are certainly refreshing, but *Allophylus* would not seem to have the extreme vagility of such genera as *Cardiospermum* and *Dodonaea*, and therefore a degree of regional speciation is to be anticipated. An alternative decision on the vexing "*Allophylus* problem" should perhaps await a very detailed study and the application of modern techniques.

USEFUL TREATMENT OF GENUS: LEENHOUTS, P. W. A conspectus of the genus *Allophylus* (Sapindaceae). *Blumea* 15: 301-385. 1968.

KEY TO SPECIES

- Branchlets, petioles, leaflet blades, inflorescence branches, bracts, and bracteoles glabrous or inconspicuously puberulent, the leaflet blades entire to undulate, the secondary nerves sometimes terminating in inconspicuous mucros. 1. *A. timoriensis*
 Branchlets, petioles, leaflet blades, inflorescence branches, bracts, and bracteoles conspicuously soft-pilose with spreading hairs 0.3-1 mm. long, the leaflet blades distinctly mucronulate-serrate at margin. 2. *A. umbrinus*

1. *Allophylus timoriensis* (DC.) Bl. Rumphia 3: 130, as *A. timorensis*. 1849.

FIGURES 137A & B, 138A & B.

Schmidelia timoriensis DC. Prodr. 1: 611. 1824.

Schmidelia obovata A. Gray, Bot. U. S. Expl. Exped. 1: 249, saltem quoad spec. sam. 1854.

Allophylus vitensis Radlk. in Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 20: 230. 1890, in Pflanz. 98 (IV. 165): 601. 1932; J. W. Parham, Pl. Fiji Isl. 173. 1964, ed. 2. 245. 1972; Leenh. in *Blumea* 15: 357. 1968.

Allophylus cobbe sensu Drake, Ill. Fl. Ins. Mar. Pac. 142. 1890; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 185. 1970; non sensu str.

Allophylus timorensis Bl. ex Guillaumin in J. Arnold Arb. 12: 240. 1931; Radlk. in Pflanz. 98 (IV. 165): 587. 1932; Christophersen in Bishop Mus. Bull. 128: 130. 1935; A. C. Sm. in Bull. Torrey Bot. Club 70: 543. 1943; Yuncker in Bishop Mus. Bull. 220: 173. 1959; J. W. Parham, Pl. Fiji Isl. 173. 1964, ed. 2. 245. 1972; Leenh. in *Blumea* 15: 355. 1968.

Allophylus subclaxus Gillespie in Bishop Mus. Bull. 83: 16. fig. 18. 1931; Radlk. in Pflanz. 98 (IV. 165): 1490. 1934; A. C. Sm. in Bull. Torrey Bot. Club 70: 542. 1943; J. W. Parham, Pl. Fiji Isl. 172. 1964, ed. 2. 245. 1972; Leenh. in *Blumea* 15: 354. 1968.

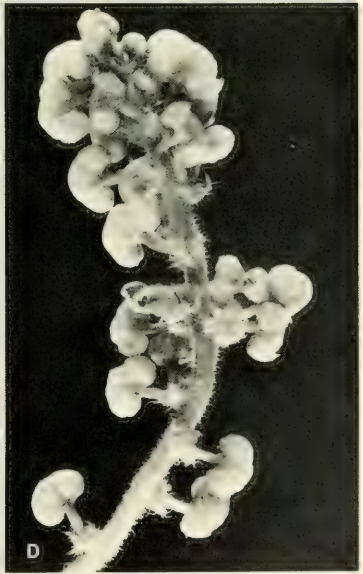
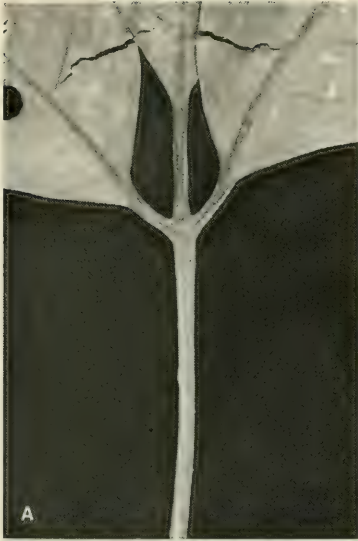
Allophylus rhomboidalis sensu Yuncker in Bishop Mus. Bull. 178: 78. 1943; non sensu str.

Allophylus sp. St. John & A. C. Sm. in Pacific Sci. 25: 332. 1971.

In Fiji *Allophylus timoriensis* occurs from near sea level to about 1,150 m. in sometimes dense forest, in limestone forest, and in thickets, as a slender shrub or tree 2-15 m. high, with white petals and stamens and a fruit that is orange to red at maturity. Flowers and fruits do not appear seasonal.

TYPEIFICATION AND NOMENCLATURE: Leenhouts in 1968 listed *Schmidelia timoriensis* as an illegitimate name, but no reason seems apparent. No other taxon is cited in de Candolle's synonymy, and his reference to Rheede's Hort. Ind. Malabar. 5: t. 25 has no bearing on legitimacy. A dried specimen from Timor is cited as the only basis of de Candolle's binomial. Radlkofer in 1932 cites the holotype as *Riedlé* (G-DC), from Timor. If one accepts *Allophylus timoriensis* (which original spelling of the epithet is here retained) as the basic species extending from Malesia into the Pacific, the binomial takes precedence over *A. ternatus* (J. R. & G. Forst.) Radlk., based on

FIGURE 137. A & B, *Allophylus timoriensis*; A, distal portion of petiole and basal portions of upper surfaces of leaflet blades, $\times 2$; B, distal portion of inflorescence branch, $\times 6$. C & D, *Allophylus umbrinus*; C, distal portion of petiole and basal portions of upper surfaces of leaflet blades, $\times 2$; D, distal portion of inflorescence branch, $\times 6$. A from Gillespie 4202, B from Smith 1161, C & D from Gillespie 4160.



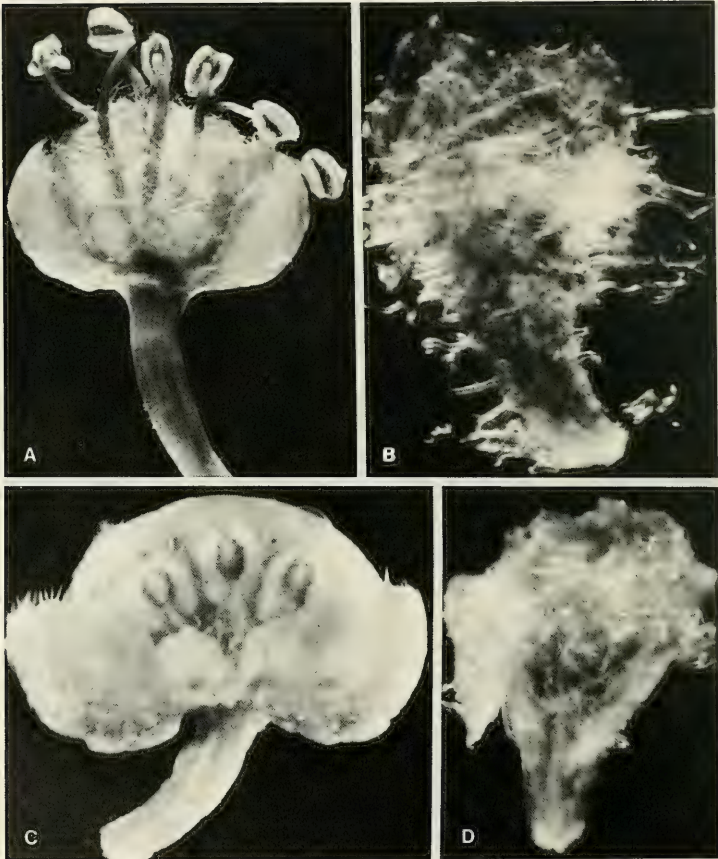


FIGURE 138. A & B, *Allophylus timoriensis*; A, ♂ flower (2 anthers fallen), × 20; B, inner surface of petal, × 60. C & D, *Allophylus umbrinus*; C, young ♂ flower with 1 sepal and 2 petals removed, showing stamens and disk lobes, × 30; D, inner surface of petal, × 60. A & B from Smith 1161, C & D from Gillespie 4160.

Aporetica ternata J. R. & G. Forst. (Char. Gen. Pl. 66. t. 66. 1775), from New Caledonia. Even though *ternatus* is the older epithet, its use in this connection is precluded by *A. ternatus* Lour. (1790), which Merrill (in Trans. Amer. Philos. Soc. n. s. 24: 246. 1935) reduced to *A. racemosus* (L.) Radlk. *Schmidelia obovata* A. Gray was based upon Bentham's interpretation (in London J. Bot. 2: 213. 1843) of *S. glabra* (non *S. glabra* (Roxb.) Steudel); although *U. S. Expl. Exped.* specimens from Samoa were mentioned by Gray, typification of his binomial should probably rest upon the specimens cited by Bentham in 1843. The type of *A. vitiensis* is Horne 464 (K

HOLOTYPE), collected in Fiji without detailed locality in 1877 or 1878. The type of *A. subluxus* is *Gillespie 4202* (BISH HOLOTYPE; ISOTYPES at BISH, K), collected Dec. 6, 1927, near Nandarivatu, Mba Province, Viti Levu.

DISTRIBUTION: Widespread from Malesia, at least from Timor, eastward to Tonga, Niue, and Samoa, and very probably extending as far east as the Marquesas and Societies. Only about 25 Fijian collections have been noted, surprisingly from only six islands thus far.

LOCAL NAMES: The only recorded names have been *kaingga* and *nggalinggawa* (Mba) and *se ndamu* (Kambara).

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Northern portion of Mt. Evans Range, between Mt. Vatuyanitu and Mt. Natondra, *Smith 4377*; Mt. Nukulevu, *DA 14819*; Mt. Nanggaranambuluta, east of Nandarivatu, *Stauffer & Koroiveibau 5832*. NADRONGA & NAVOSA: Nausori Highlands, *DA 12567*. SERUA: Hills east of Navua River, near Nukusere, *Smith 9127*. NAMOSI: Track to Mt. Vakarongasiu, *DA 16167*. RA: Ridge from Mt. Namama (east of Nandarivatu) toward Mt. Tomanivi, *Smith 5687*. TAILEVU: Wailutu Copper Mine, Wainivesi River, *DA 13646*. OVALAU: Above Levuka, *Gillespie 4524*. VANUA LEVU: MATHUATA: Islands off coast, *Greenwood 678*. TAVEUNI: Vicinity of Waiyevo, *Gillespie 4731*. KAMBARA: On limestone formation, *Smith 1287*. FULANGA: On limestone formation, *Smith 1161*.

Allophylus subluxus and *A. vitiensis* are scarcely to be maintained at any level. The latter is separable from a reasonable concept of *A. timoriensis* only in having its leaf blades prevailing oblong-lanceolate, about three times as long as broad, and gradually acuminate at apex, rather than prevailing obovate to ovate or elliptic, about twice as long as broad, and rounded to obtuse, cuspidate, or abruptly acuminate at apex. Among our specimens, *Horne 464* (type), *Greenwood 678*, and *DA 14819* would fall into *A. vitiensis* if it were retained.

2. *Allophylus umbrinus* A. C. Sm. in Bull. Torrey Bot. Club 70: 543. 1943; J. W. Parham, Pl. Fiji Isl. 173. 1964, ed. 2. 245. 1972; Leenh. in Blumea 15: 356. 1968.

FIGURES 137C & D, 138C & D.

Allophylus umbrinus, which Leenhouts dismisses as "doubtless one of the Pacific forms of *ternatus/timorensis*," occurs in dense forest at an elevation of about 1,000 m., as a small tree with white flowers.

TYPIFICATION: The type is *Gillespie 4160* (A HOLOTYPE; ISOTYPES at BISH, K), collected Dec. 3, 1927, in dark woods along a stream above Nandarivatu, Mba Province, Viti Levu.

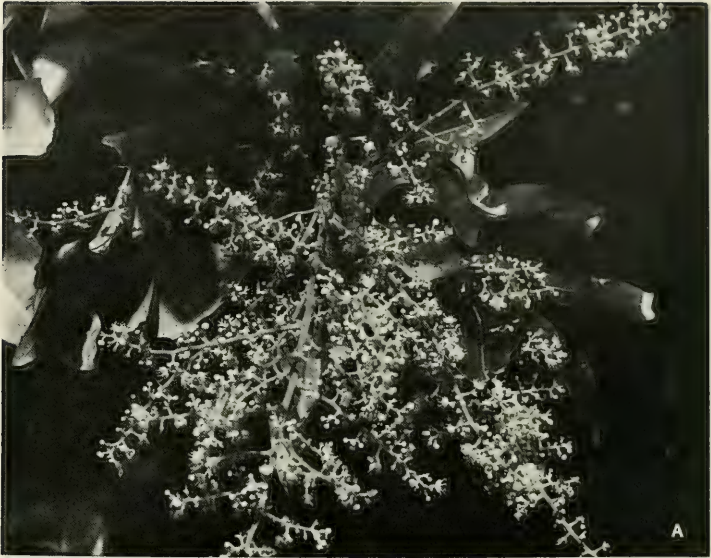
DISTRIBUTION: Endemic to Fiji and thus far known only from the type collection.

LOCAL NAME: *Sita*.

If Leenhouts's analysis of *Allophylus* were to be taken as final, this plant could be ignored as a shade form of a massive complex; nevertheless, it is recognizably distinct from the general population of the genus in the Fijian Region, although no consequential floral characters support those of the vegetative indument and leaflet margins.

3. *SAPINDUS* L. Sp. Pl. 367. 1753; Seem. Fl. Vit. 47. 1865; Radlk. in Pflanzenr. 98 (IV. 165): 630. 1932.

Monoecious trees, the leaves spirally arranged, paripinnate (rarely simple but not in our species), the leaflets subopposite or alternate, with entire, subcoriaceous blades; inflorescences terminal, paniculiform, widely branched, the flowers essentially actinomorphic; sepals 5, broadly imbricate, unequal; petals 5 (in our species), squamate within at base, the scale emarginate-bifid and pilose, ecristate; stamens 8, the filaments proximally pilose, the anthers ellipsoid, introrse (sterile in ♀ flowers); disk (in our species) annular and glabrous; ovary ovoid (rudimentary in ♂ flowers), in ♀ flowers 3-lobed, each locule with 1 ascending ovule, the stigma 3-lobed; fruit a fleshy schizocarp, with 1 or 2 mericarps developing, these subglobose, with a single exarillate seed.



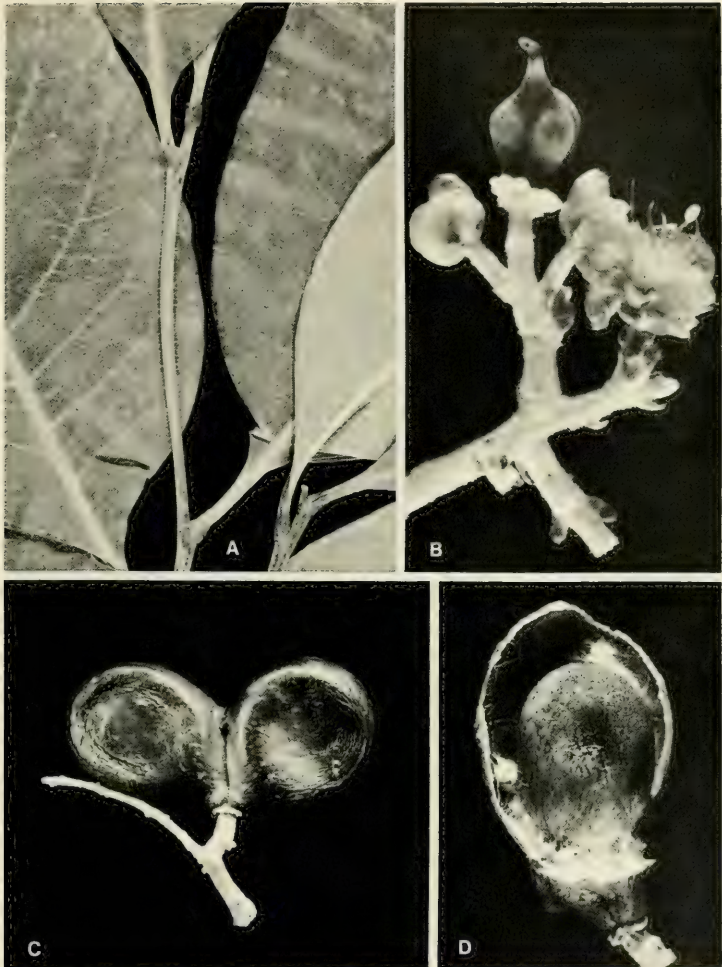


FIGURE 140. *Sapindus vitiensis*; A, distal portions of leaf rachises (upper surface) and leaflet bases, $\times 2$; B, ultimate cluster of flowers, 1 ♀ past anthesis, 1 ♂ at anthesis (1 anther remaining), and 2 ♂ buds, $\times 6$; C, fruit with 2 mericarps, $\times 2$; D, fruit with 1 mericarp, part of pericarp removed to show indument of inner surface, and exarillate seed, $\times 4$. A, C, & D from *Smith 8063*, B from *Smith 7900*.

FIGURE 139. *Sapindus vitiensis* on edge of forest along rocky shore on Ngau, from *Smith 7900*, \times about 1/3; A, inflorescence; B, foliage and young infructescences.

LECTOTYPE SPECIES: *Sapindus saponaria* L. (vide Britton & Brown, Ill. Fl. N. U. S. ed. 2. 2: 500. 1913), one of the two original species.

DISTRIBUTION: Pantropical, with about 13 species. *Sapindus saponaria*, although primarily American, has a wide distribution and (at least in some form) occurs on eastern Pacific islands (Pitcairn, Easter, Marquesas, Societies, Mangareva, and Hawaii), but I find no evidence of its occurrence in the Fijian Region. Our single species has fewer leaflets than *S. saponaria* and an unwinged rachis.

1. *Sapindus vitiensis* A. Gray, Bot. U. S. Expl. Exped. 1: 251. 1854; Walp. Ann. Bot. Syst. 4: 378. 1857; Seem. in Bonplandia 9: 254. 1861, Viti, 434. 1862, Fl. Vit. 47. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 143. 1890; Radlk. in Pflanzenr. 98 (IV. 165): 655. 1932; J. W. Parham, Pl. Fiji Isl. 174. 1964, ed. 2. 247. 1972.

FIGURES 139, 140.

A sometimes spreading tree 4–30 m. high, occurring from near sea level to about 200 m. in forest or on its edges and along rocky shores. Vegetative parts are glabrous; leaves 20–35 cm. long, the rachis subterete (drying indistinctly angled), the leaflets (4–) 6–8, with blades ovate- to lanceolate-oblong, 6–14 × 2.5–5 cm., acute to gradually acuminate, entire, copiously reticulate-veined. The large, terminal panicles, with copiously tomentose branches and short petioles, may be as much as 30 cm. in diameter; the petals and filaments are white, the anthers yellow. In fruit 1 or 2 mericarps develop, these attaining a size of 18 × 13 mm., dark red at maturity. Flowers have been noted only from May to July and fruits from June to September.

TYPIFICATION: The type is *U. S. Expl. Exped.* (US 27660 HOLOTYPE; ISOTYPES at GH, K, P), collected in Fiji in 1840. Gray mentions Viti Levu (Rewa) and Ovalau, but it is not possible to tie the holotype or putative isotypes to either locality.

DISTRIBUTION: Fiji and Samoa; it is not frequent in Fiji, despite Gray's statement "common on the leeward coasts," now being known from only eleven collections from seven of the high islands.

LOCAL NAMES: Names, each recorded only once, are *ndrengandrenga* (Ra), *sawailau* (Mbengga), and *saweilau* (Ovalau).

AVAILABLE COLLECTIONS: VITI LEVU: RA: Mataimeravula, vicinity of Rewasa, near Vaileka, *Degener 15448*. MBENGGGA: Ndakuni, *DA 2082*. OVALAU: Vicinity of Thawathi, *Smith 8063*; valley of Mbureta and Lovoni Rivers, *Smith 7553*. MOTURIKI: *Seemann 66*, p. p. NGAU: Shore of Herald Bay, vicinity of Sawaieke, *Smith 7900*. VANUA LEVU: MATHUATA: *Seemann 66*, p. p. THAKAUNDROVE: Vicinity of Mbangasau, *Howard 111*. TAVEUNI: *DA 11509*.

4. LITCHI Sonnerat, Voy. Ind. Orient. 3: 255. 1782; Radlk. in Pflanzenr. 98 (IV. 165): 914. 1932; Leenh. in Blumea 24: 398. 1978.

Monococious or polygamomonococious trees with paripinnate, (1-)2-4(-5)-jugate leaves; inflorescences cymose-paniculate, the flowers actinomorphic, without petals, the calyx 4-lobed, the disk annular, pilose to glabrous, the stamens 6–10, the filaments pilose; ovary in ♀ and ♂ flowers usually deeply 2-lobed, each locule with 1 obliquely erect ovule; fruit usually with only 1 mericarp developing, this covered with flat, mucronate tubercles, indehiscent, the seed entirely enveloped by a white, carnosely ariloid free except at base.

TYPE SPECIES: *Litchi chinensis* Sonnerat, included as part of the original descriptio generico-specifica.

DISTRIBUTION: Southeastern Asia and parts of Malesia. In his informative 1978 discussion Leenhouts recognizes a single species with three subspecies, to replace the

two species, each with two forms, recognized by Radlkofer.

USEFUL TREATMENT OF GENUS: LEENHOUTS, P. W. Systematic notes on the Sapindaceae-Nephelieae. *Blumea* 24: 395-403. 1978.

1. **Litchi chinensis** Sonnerat, *Voy. Ind. Orient.* 3: 255. *pl. 129.* 1782; Radlk. in *Pflanzenr.* 98 (IV. 165): 917. *fig. 21.* 1932; J. W. Parham in *Agr. J. Dept. Agr. Fiji* 19: 101. 1948; Purseglove, *Trop. Crops, Dicot.* 642. 1968; J. W. Parham, *Pl. Fiji Isl. ed. 2.* 247. 1972; Leenh. in *Blumea* 24: 398. 1978.

Infrequently cultivated in Fiji near sea level, the *lychee* is a fruit tree attaining a height of 10 m., with a heavy trunk and a spreading crown. The flowers are pale greenish yellow, borne in large terminal panicles. The fruits are subglobose, 3-3.5 cm. in diameter, bright red to purplish when ripe and covered with small, pyramidal tubercles; the seed is brown, covered with a white, fleshy, juicy, translucent arilloid.

TYPEIFICATION: The type is *Sonnerat 1062* (G HOLOTYPE in Delessert Herbarium).

DISTRIBUTION: As of the genus, but subsp. *chinensis* presumably originated in northern Indo-China (Leenhouts, 1978) and has long been cultivated in China, only comparatively recently having become established in many other tropical and subtropical areas.

LOCAL NAMES AND USES: *Lychee* or *litchi*; the arilloid of the seed is edible fresh or preserved in syrup.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Nasinu Experiment Station, *DA 1545.* REWA: Suva Botanical Gardens, *DA 17237.*

The widespread cultivated plant falls into subsp. *chinensis* (cf. Leenhouts, 1978, p. 399). It was probably introduced into Fiji by J. B. Thurston, who listed it (as "*Nephelium litchie*") in his 1886 *Catalogue*. It is possible that fruits do not develop in Fiji, where it is still a rarely cultivated plant.

5. **POMETIA** J. R. & G. Forst. *Char. Gen. Pl.* 55. 1775, ed. 2. 109. 1776; Seem. *Fl. Vit.* 48. 1865; Radlk. in *Pflanzenr.* 98 (IV. 165): 924. 1932; M. Jacobs in *Reinwardtia* 6: 114. 1962.

Monoecious trees, often buttressed; leaves paripinnate, the leaflets subsessile, the blades subcoriaceous, the basal pair often less than 2 cm. long and auricle-like, sometimes stipuliform; inflorescences usually terminal, paniculiform, the flowers actinomorphic, with short, filiform pedicels; calyx cupuliform, 5-lobed, the lobes slightly imbricate in bud; petals 5, esquamate; stamens 5, the filaments filiform, the anthers sterile in ♀ flowers; disk annular and glabrous; ovary in ♀ flowers deeply 2-lobed (rudimentary in ♂ flowers), each locule with 1 basal ovule, the style undivided, elongating and twisting after anthesis; fruit mostly composed of a single mericarp with a stylar scar near its base, the pericarp smooth, coriaceous, the mesocarp juicy, the single seed partially enveloped by a thin, basally attached arilloid.

TYPE SPECIES: *Pometia pinnata* J. R. & G. Forst., the only original species.

DISTRIBUTION: From Ceylon throughout Malesia and eastward to Tonga, Niue, and Samoa, cultivated elsewhere. Nine species were recognized by Radlkofer, but Jacobs in his 1962 revision accepts only two, one of which is a restricted Malesian endemic. The widespread species, *Pometia pinnata*, is divided into eight forms, in addition to a number of "paramorphs." I am unable to evaluate this conclusion, but it is evident that all the Pacific material (from the Solomon Islands eastward) falls into the type-including f. *pinnata*.

USEFUL TREATMENT OF GENUS: JACOBS, M. *Pometia* (Sapindaceae), a study in variability. *Reinwardtia* 6: 109-144. 1962.

1. *Pometia pinnata* J. R. & G. Forst. Char. Gen. Pl. 55. t. 55. 1775, ed. 2. 110. t. 55. 1776; Forst. f. Fl. Ins. Austr. Prodr. 74. 1786; Seem. Fl. Vit. 48. t. 10. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 143. 1890; Radlk. in Pflanzenr. 98 (IV. 165): 929. 1932; Guillaumin in J. Arnold Arb. 14: 56. 1933; Christophersen in Bishop Mus. Bull. 128: 130. 1935; B. E. V. Parham in Agr. J. Dept. Agr. Fiji 13: 46. 1942; Yuncker in Bishop Mus. Bull. 178: 78. 1943, in op. cit. 184: 49. 1945; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 101. 1948; Yuncker in Bishop Mus. Bull. 220: 173. 1959; M. Jacobs in Reinwardtia 6: 120. 1962; J. W. Parham, Pl. Fiji Isl. 174. fig. 63. 1964, ed. 2. 247. fig. 72. 1972; van Royen in Manual For. Trees Papua New Guinea 2: 37. fig. 17. 1964; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 187. 1970; St. John & A. C. Sm. in Pacific Sci. 25: 332. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 45, 125. 1972.

Nephelium pinnatum Camb. in Mém. Mus. Hist. Nat. 18: 30. 1829; A. Gray, Bot. U. S. Expl. Exped. 1: 259. 1854; Seem. in Bonplandia 9: 254. 1861, in op. cit. 10: 296. 1862, Viti, 434. 1862.

As it occurs in Fiji, this widespread species is found in forest and on its edges, in open woods, and in open country (retained when the forest is cut, and also cultivated in villages) at elevations from near sea level to about 300 m. It is noted as a tree 10–27 m. high, with a straight, buttressed trunk and a spreading crown, and with a characteristically pink leaf flush. The petals and filaments are white, the anthers red or yellow, and the style is red. The ripe fruit is dull reddish, spherical, to 3 cm. in diameter, with gelatinous white pulp surrounding a large seed. Flowers are most often noted between December and March (but also in other months), and the best fruiting season is from March to May.

TYPIFICATION: In the original publication no locality is cited, but in 1786 G. Forster mentioned "Tanna, Namoka." I do not understand Jacobs's 1962 designation of the New Hebrides as the type locality nor his comment: "In the BM there are two collections by Forster. The one from Namoka was found to have been designated as the type; hence that from Tonga does not belong to the type collection." Of the two sheets at BM, one is labelled only "G. Forster's Herbarium," and this Jacobs has annotated as the type. The second sheet bears the inscription "Tanna & Amsterdam—Insula Oceani Pacifici. J. R. & G. Forster." In fact neither sheet is noted as from "Namoka." It is possible that G. Forster recalled obtaining the Tongan material from Nomuka Island, somewhat north of Tongatapu (i. e. "Amsterdam"), but I doubt if the Forsters ever visited Namouka Island in the New Hebrides. It now seems impossible to tie either BM sheet to a precise locality, but I believe that the second (and better) sheet is the preferable lectotype, to be cited: Tanna, New Hebrides, and Tongatapu (or possibly Nomuka), Tonga, J. R. & G. Forster (BM LECTOTYPE).

DISTRIBUTION (of f. *pinnata*): Philippines and Celebes eastward to Tonga, Niue, and Samoa, but also cultivated as far east as the Marquesas, Tuamotus, and Hawaii. There seems little doubt that the species is indigenous in Fiji, Tonga, Niue, and Samoa, within the range of fruit-eating bats that presumably disperse the fruits (Jacobs, 1962, p. 116; Sykes, 1970). In parts of Samoa, *Pometia pinnata* is a dominant tree in some forests (Whistler in Allertonia 2: 116, 153. 1980), but in Fiji it does not seem as dominant as implied by Seemann (1865); only 27 Fijian collections from nine islands have been noted.

LOCAL NAMES AND USES: The usual names are *ndawa* or *tawa*, but also recorded are *ndawandawa*, *ndawa moli*, and *ndawa sere*. The species is valued for the edible pulp of

the fruit and also as a timber tree; the bark has been ascribed medicinal uses as a diuretic and as an internal remedy for "pain in bones" and "aching chests."

REPRESENTATIVE COLLECTIONS: VITI LEVU: SERUA: Inland from Namboutini, *DF 501 (Damanu 140)*. NAMOSI: Namosi Village, *Weiner 4B*. NAITASIRI: Waindrandra Creek, below Nawanggambena, *DA 1536*. TAILEVU: Namara, *Seemann 71*, p. p. REWA: Lami, *DA 6003*. MBENGGGA: Savusavukalou, *Weiner 200*. KANDAVU: Western end of island, near Cape Washington, *Smith 300*. OVALAU: Hills southeast of valley of Mbureta River, *Smith 7403*. TAVEUNI: *Seemann 71*, p. p.; vicinity of Waiyevo, *Gillespie 4808*. MOALA: *Tothill 58*. VANUA MBALAVU: Near Narothiso Village, *Garnock-Jones 1121*. LAKEMBA: Between Yandrana and Vakano, *Garnock-Jones 959*. FULANGA: On limestone formation, *Smith 1192*. FIJI without further locality, *U. S. Expl. Exped., Storck 875*.

6. *ALECTRYON* Gaertn. *Fruct. Sem. Pl.* 1: 216. 1788; Radlk. in *Pflanzenr.* 98 (IV. 165): 983. 1933; S. Reynolds in *Austrobaileya* 1: 472. 1982.

Monoecious or polygamomonoecious trees, the indument of simple hairs, the leaves paripinnate, with often coriaceous leaflet blades; inflorescences axillary, solitary, paniculate (as in our species), racemiform, or spiciform, the flowers actinomorphic, mostly unisexual; calyx with 4-6 valvate or narrowly imbricate lobes; petals 4 or 5 or (as in our species) none, when present small, with bilobed, ecristate scales; stamens 5-8 (8 in our species), exerted, the filaments filiform, the anthers as long as or longer than filaments; disk annular, small, carinose; ovary in ♀ or ♂ flowers 2-4-lobed, each locule with 1 basal ovule, the style short, with inconspicuous or recurved lobes; fruits with 1 or 2 mericarps maturing, the pericarp rough, often lenticillate and tardily glabrate, irregularly splitting, the single seed globose, shiny, with a slightly lobed, fleshy, basal aril.

TYPE SPECIES: *Alectryon excelsus* Gaertn. (as *A. excelsum*).

DISTRIBUTION: Malesia to Australia and New Zealand, and eastward in the Pacific to Samoa and Hawaii. Twenty-six species were recognized by Radlkofer, but the two known from Fiji have been more recently described. Reynolds (1982) indicates the number of species as 15. In his interesting discussion of loss of dispersibility in island plants, Carlquist (*Island Biology*, 1974, pp. 478-480) mentions the genus as comprising about 30 species and notes the progressively enlarged fruits in the species of Fiji, Samoa, and Hawaii. Two species occur in Fiji, one of them endemic.

USEFUL TREATMENT OF GENUS: REYNOLDS, S. T. *Alectryon*. *Austrobaileya* 1: 472-481. 1982.

In sterile condition *Alectryon* in our area may be confused with *Sapindus*, *Cupaniopsis*, or *Elattostachys*, but the following characters are useful: leaf rachis with sharp, abaxially projecting angles or very narrow wings on upper edges; distal leaflets paired or subopposite, often with a callus between them (but sometimes one of these leaflets lacking, the leaf then appearing imparipinnate); indument of rachis, costa beneath, etc., of minute, scurfy hairs in irregular clusters (not stellate but suggestive of that condition), the indument eventually nearly lost but persisting in patches here and there.

KEY TO SPECIES

- Leaves comparatively robust, 45-90 cm. long, the petiole 9-35 cm. long, the leaflets 8-12, with petiolules to 15 mm. long and oblong or oblong-lanceolate blades (11-) 14-39 × (3.5-) 5.5-12 cm., the secondary nerves 15-30 per side; inflorescences robust, (12-) 15-40 × 7-25 cm.; fruits comparatively small, the mericarps if single 11-22 mm. in diameter, if double 10-18 mm. in diameter, the seeds 9-13 mm. in diameter. 1. *A. grandifolius*
- Leaves less robust, 30-40 cm. long, the petiole 5-9 cm. long, the leaflets 6-10, with petiolules to 10 mm. long and prevalingly lanceolate blades 10-22 × 3-7 cm., the secondary nerves 9-14 per side; inflorescences 5-13 cm. long; fruits comparatively large, the mericarps if single 20-40 mm. in diameter, if double 17-30 mm. in diameter, the seeds 14-33 mm. in diameter. 2. *A. samoensis*

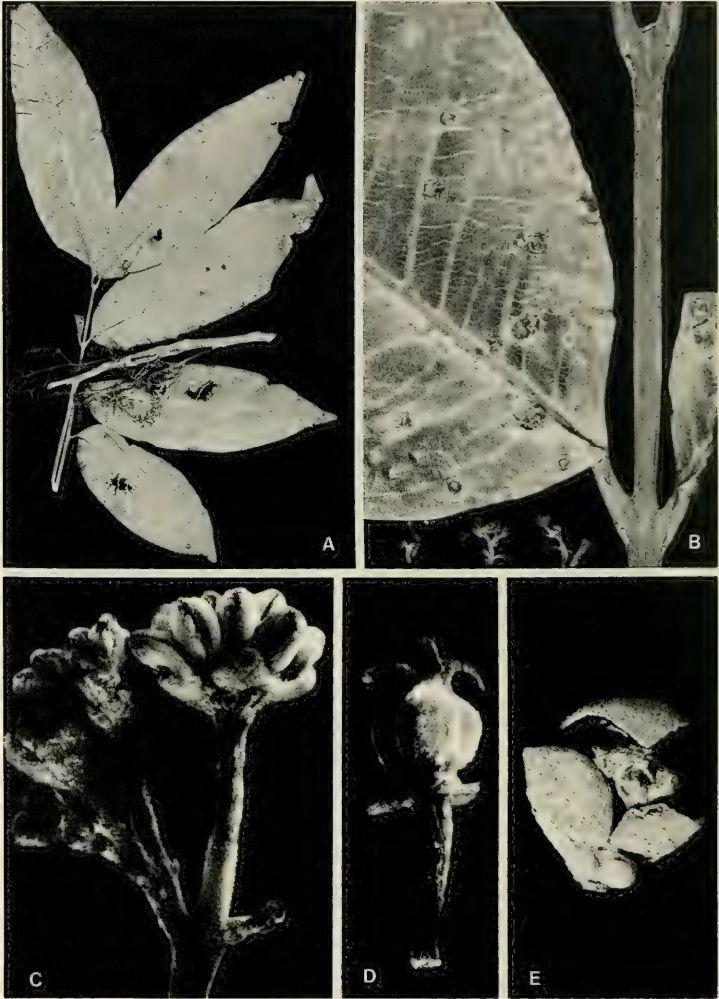


FIGURE 141. *Alectryon grandifolius*; A, branchlet with a leaf and inflorescences, $\times 1/4$; B, distal portion of leaf rachis (upper surface) and leaflet bases, $\times 2$; C, ultimate cluster of σ flowers, $\times 10$; D, ρ flower past anthesis, $\times 10$; E, fruit with splitting pericarp, showing seed with basal aril, $\times 2$. A-C from Smith 1055, D from DA 5835, E from Gillespie 2981.

1. *Alectryon grandifolius* A. C. Sm. in Bishop Mus. Bull. **141**: 90, fig. 47. 1936, in J. Arnold Arb. **31**: 292. 1950; J. W. Parham, Pl. Fiji Isl. 172. 1964, ed. 2. 245. 1972.

FIGURES 141, 142A.

Slender tree (2-) 5-15 m. high, occurring in dense or open forest or on forested ridges at elevations of 30-700 m. The branchlets and large leaves are closely pilose but soon essentially glabrate; the petiole and rachis are grooved above and with obvious projecting angles. The petals are noted as pale yellow or cream-white, the pericarp is reddish brown and often lenticellate, and the seeds are blackish or reddish brown, shiny, and with a scarlet aril. Flowers have been obtained between August and February, fruits between June and September.

TYPEFICTION: The type is *Smith 1055* (BISH HOLOTYPE; many ISOTYPES), collected Feb. 2, 1934, on the main ridge of Koro.

DISTRIBUTION: Endemic to Fiji, but thus far known from only three of the high islands. Although it is more common than originally realized, only 14 collections, all here cited, are at hand. None of the early botanists in Fiji seem to have found this species.

LOCAL NAMES: *Masa*; *ndawandawa*. The first of these is often general for the family, and the second usually refers to *Pometia*.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 938*. NAMOSE: Ridges near Namosi Village, *Gillespie 2981*. NAITASIRE: Below Ndraviwalai, *DA 1812*; Tamavua-Sawani road, *Setchell & Parks 15140*; Prince's Road, mile 8, *Vaughan 3277*; vicinity of Nasinu, *Gillespie 3533*. TAILEVU: Wainiveimbambala Creek, *DA 5835, 5836*; near Visa, *DA 199*; Naitaratanithangi, *DA*, April 12, 1949. KORO: Ndelaikoro, *DA 15828*. VANUA LEVU: THAKAUNDOVE: Southwestern slopes of Mt. Mbatini, *Smith 713*. ISLAND?: Wandratoka, *DA 290*.

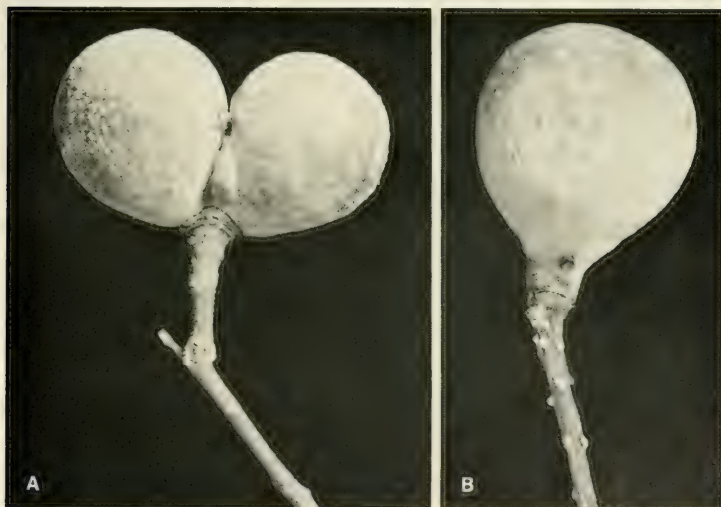


FIGURE 142. A, *Alectryon grandifolius*; fruit with 2 mericarps, the third aborted, $\times 2$. B, *Alectryon samoensis*; fruit with 1 developed mericarp, $\times 2$. A from *DA 15828*, B from *Smith 1270*.

2. *Alectryon samoensis* Christophersen in Bishop Mus. Bull. **128**: 130. *fig. 16*. 1935; Yuncker in op. cit. **184**: 49. 1945; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 123. 1972. FIGURE 142B.

Alectryon sp. Christophersen in Bishop Mus. Bull. **128**: 132. 1935; A. C. Sm. in op. cit. **141**: 92. 1936.

In Fiji *Alectryon samoensis* is known only from forest on limestone at an elevation of less than 100 m., but in Samoa it occurs up to 1,400 m. elevation. It is noted as a tree 8-17 m. high, with basic characters similar to those of the preceding species but readily distinguished by its comparatively small leaves and inflorescences and its notably larger fruits and seeds. Samoan specimens have flowers in September, fruits in September to November. The Fijian collection was fruiting in March.

TYPEIFICATION: The type is *Christophersen 2678* (BISH HOLOTYPE; ISOTYPES at BISH, US), collected Sept. 23, 1931, in forest above Salailua, Savai'i, Samoa.

DISTRIBUTION: The species is rare in Samoa, and in Fiji is known from a single Lauan collection.

LOCAL NAME: *Masa*.

AVAILABLE COLLECTION: KAMBARA: On limestone formation, *Smith 1270*.

The sole Fijian collection, which I noted in 1936, is now seen to be indistinguishable from *Alectryon samoensis*, as is *Christophersen 3302*, which he left unidentified.

7. *GUIOA* Cav. Icon. Descr. Pl. **4**: 49. 1797; Radlk. in Pflanzenr. **98** (IV. 165): 1157. 1933.

Monoecious trees or shrubs, the leaves paripinnate, the leaflet blades subcoriaceous or chartaceous, usually glaucous beneath; inflorescences axillary or borne on branches, paniculiform, freely branched, the flowers unisexual, in our species actinomorphic; calyx composed of 5 broadly imbricate, nearly free sepals, these unequal, suborbicular, gland-dotted; petals 5, small, short-clawed, with pilose, cristate scales; stamens 8, exserted, the filaments pilose; disk usually incomplete or (as in our species) annular; ovary in ♀ flowers acutely trigonous, 3-locular, each locule with 1 basal ovule, the style curved, with 3 stigmatic lobes; fruit capsular, obcordate, loculicidally 2- or 3-valved (infrequently 1-valved), the lobes laterally flattened and winglike, usually compressed and with thickened margins, glabrous on both surfaces, the seeds compressed-ellipsoid, with a nearly complete, thin aril, this extended into distal appendages exceeding seed in length, sometimes also with a free, slender, proximal, folded appendage.

TYPE SPECIES: *Guioa lentiscifolia* Cav.

DISTRIBUTION: Radlkofer's revision of *Guioa* was incomplete at his death and was prepared for publication without a key or elaboration by T. Herzog; in the *Pflanzenreich* about 60 species are recognized, but more have been since described. The genus extends from the Philippines, Malesia, and Australia eastward to Tonga and Samoa. A modern revision is much needed. Three species are here included from Fiji.

KEY TO SPECIES

- Branchlets, petioles, leaf rachis, etc., strigillose with minute, closely appressed hairs (to 0.2 mm. long); indument of lower leaflet blade surface similarly appressed, often sparse; leaflets 5 or more.
 Leaflets (5-) 6-12, the blades lanceolate, (3-) 4-10 × 1-3.5 cm., sparsely pilose beneath; inflorescence branches appressed-pilose but often sparsely so; sepals usually 1-2 mm. in diameter, the petal scales sparsely setulose. 1. *G. rhoifolia*
 Leaflets 5-8, the blades elliptic-oblong to ovate-lanceolate, (6-) 8-15 × 2.5-5.5 cm., obviously appressed-golden-pilose beneath; inflorescence branches copiously golden-pilose; sepals usually 1.5-2.5 mm. in diameter, the petal scales densely barbellate-ciliolate. 2. *G. chrysea*
 Branchlets, petioles, leaf rachis, etc., copiously soft-pilose with spreading hairs (0.3-0.6 mm. long); indument of lower leaflet blade surface similarly copious and spreading; leaflets 2-4, the blades elliptic, usually 8-13 × 4-5.7 cm. 3. *G. capillacea*

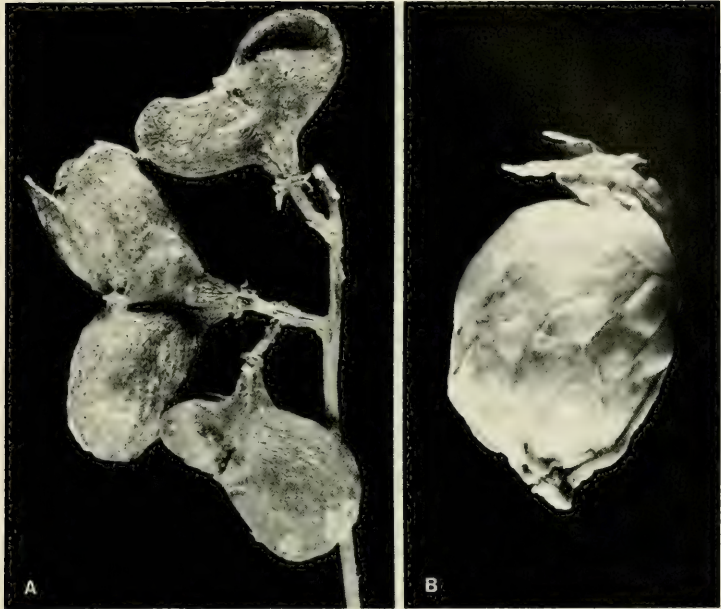


FIGURE 143. *Guioa rhoifolia*, from Bryan 449; A, fruits, $\times 2$; B, seed covered by aril, showing distal appendages, $\times 4$.

1. *Guioa rhoifolia* (A. Gray) Radlk. in Actes Congr. Internat. Bot. Amsterdam 1877: 108. 1879; Gibbs in J. Linn. Soc. Bot. 39: 143. 1909; Radlk. in Pflanzenr. 98 (IV. 165): 1158. 1933; J. W. Parham, Pl. Fiji Isl. 174. 1964, ed. 2. 247. 1972.

FIGURE 143.

Cupania rhoifolia A. Gray, Bot. U. S. Expl. Exped. 1: 254. 1854; Seem. in Bonplandia 9: 254. 1861, Viti, 434. 1862; A. Gray in Bonplandia 10: 35. 1862, in Proc. Amer. Acad. Arts 5: 316. 1862; Seem. Fl. Vit. 46. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 143. 1890.

Sapindaceae Seem. in Bonplandia 9: 254. 1861.

Guioa subfalcata Radlk. in Actes Congr. Internat. Bot. Amsterdam 1877: 90. 1879, in Pflanzenr. 98 (IV. 165): 1161. 1933; Christophersen in Bishop Mus. Bull. 128: 132. 1935.

In Fiji *Guioa rhoifolia* is frequent from near sea level to an elevation of about 1,195 m., occurring in various types of forest or in thickets as a tree or shrub 2–15 m. high, sometimes with a compact crown; on exposed ridges it may be only 1 m. high and may have unusually small leaves. Its sepals, petals, and filaments are white, its anthers yellow to red or rich purple, its gynoecium is pale green, and its fruits are at length brown, with glossy, red or red-brown seeds. Flowers and fruits have been noted throughout the year.

TYPIFICATION AND NOMENCLATURE: The type is *U. S. Expl. Exped.* (US 17736 & 17737 HOLOTYPE; ISOTYPES at GH, K), collected in 1840 on Ovalau. *Guioa subfalcata* is also typified by a *U. S. Expl. Exped.* collection, from Upolu, Samoa; no specimen so annotated has been located at US, but there is such a specimen at GH (ISOTYPE). Samoan material passing as *G. subfalcata* seems to me essentially identical to Fijian material.

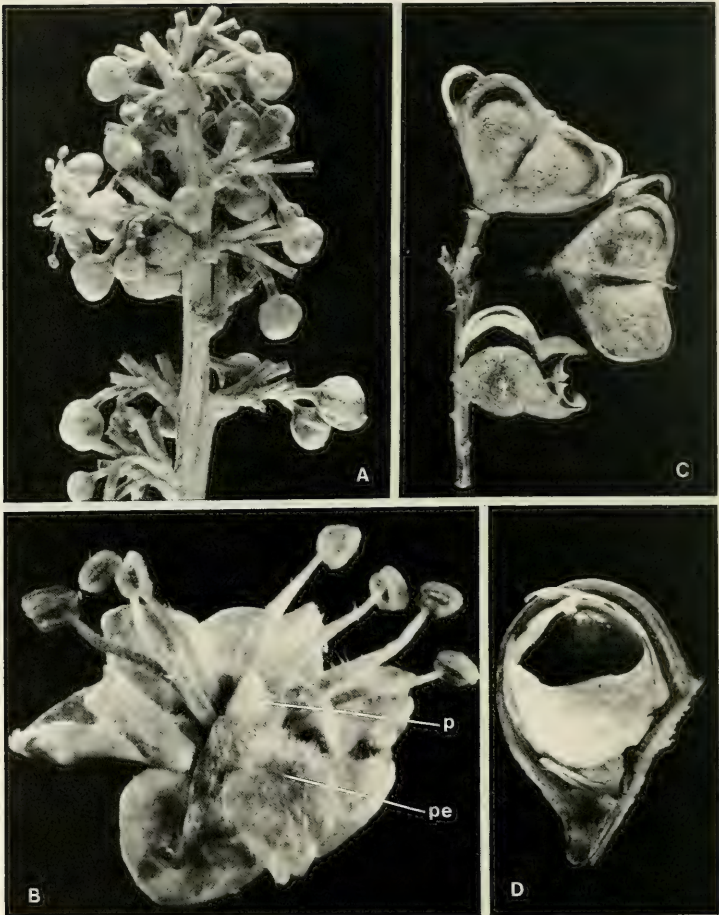


FIGURE 144. A-C, *Guioa chrysea*; A, distal portion of inflorescence branch and flowers, $\times 4$; B, σ flower, showing petal (pe) with cristate scale and pistillode (p), $\times 16$; C, dehiscent fruits, showing lobes with thickened margins, $\times 2$. D, *Guioa capillacea*; valve of fruit with seed and aril exposed, showing aril with distal appendages and also with a folded proximal appendage, $\times 4$. A & B from *Smith 5020*, C from *Webster & Hildreth 14266*, D from *Smith 1715*.

DISTRIBUTION: Fiji and Samoa; I have examined about 40 Fijian collections from nine islands, but apparently the species is less frequent in Samoa.

LOCAL NAMES AND USES: *Masa* and *marasa* are the usual names, but also recorded are *ndrausasa*, *mbaka ni vundi*, *wive*, *kailoa*, and *kauloa*; I would suspect the last four of these to be misused. The plant provides posts, stakes, timbers for houses, and firewood.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Nakawa Gulch, west of Mbatinaremba, *St. John 18143*. VITI LEVU: MBA: Summit of Mt. Koroyanitu, high point of Mt. Evans Range, *Smith 4223*; below Mt. Koromba, *DA 14731*; between Nandarivatu and Waikumbukumbu, *Gibbs 687*. NANDRONGA & NAVOSA: Southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, *Smith 4603*. SERUA: Hills west of Waivunu Creek, between Ngaloa and Korovou, *Smith 9241*. NAMOSI: Mt. Voma, *DA 11656*. RA: Between Penang and Ellington, *Greenwood 749*. NAITASIRE: Mendrausuthu Range, *DA 15466*; vicinity of Nasinu, *Gillespie 3624*. REWA: Between Suva and Lami, *Gillespie 2074*. VITI LEVU without further locality, *Seemann 74*. KANDAVU: *Seemann 69*. OVALAU: Hills west of Lovoni Valley, on ridge south of Mt. Korolevu, *Smith 7530*. KORO: Western slope, *Smith 1084*. VANUA LEVU: MATHUATA: Serua, Ndreketi River, *DA 13907*. VANUA MBALAVU: Northern limestone section, *Smith 1477*. KATA-FANGA: *DA 3789*. FULANGA: *Bryan 449*.

2. *Guioa chrysea* A. C. Sm. in *Sargentia* 1: 54. 1942, in *J. Arnold Arb.* 31: 292. 1950; J. W. Parham, *Pl. Fiji Isl.* 174. 1964, ed. 2. 247. 1972. FIGURE 144A-C.

Sapindaceae (*Cupania?*) Seem. in *Bonplandia* 9: 254. 1861.

Tree 3–20 m. high, found at elevations between sea level and 1,075 m. in dense forest or on its edges, in the forest-grassland transition, and on open hillsides. The petals and filaments are noted as white, the anthers as pink, and the disk is pale yellow. Flowers have been obtained between January and August, fruits in most months.

TYPIFICATION: The type is *Degener 14398* (A HOLOTYPE; ISOTYPES at BISH, K), collected Feb. 15, 1941, in the vicinity of Nandala, south of Nandarivatu, Mbua Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and now known from four of the high islands; about 35 collections have been examined.

LOCAL NAMES: Recorded names are *marasa*, *marasa levu*, *ndrausasa*, and *kaula*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Upper slopes of Mt. Koromba, *Smith 4632*; west of Nandarivatu, *Webster & Hildreth 14266*; vicinity of Nandarivatu, *Smith 5020*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 13790* (*DF 391*). SERUA: Vicinity of Ngaloa, *DA L.22325* (*Nasoqiri s. n.*). NAITASIRE: Waindina River basin, *MacDaniels 1040*. TAILEVU: Ndravuni, Verata Tikina, *Bola 23*. OVALAU: Vicinity of Levuka, *Gillespie 4717*; Port Kinnaird, *Seemann 73*. VANUA LEVU: MBUA: Rukuruku Bay, *H. B. R. Parham 350*; road to Ndama Village, *DA 16690*. MATHUATA: Seangangga Plateau, *DA 16668*; Naketei, Lambasa, *DF 368* (*Damanu 57*). THAKAUNDROVE: Near Malaniwai Creek, Natewa Peninsula, *Howard 124*. TAVEUNI: Vicinity of Somosomo, *Gillespie 4772*.

3. *Guioa capillacea* A. C. Sm. in *J. Arnold Arb.* 31: 293. 1950; J. W. Parham, *Pl. Fiji Isl.* 174. 1964, ed. 2. 247. 1972. FIGURE 144D.

The single known collection is from a tree about 8 m. high, occurring in thin forest between 10 and 200 m. elevation, thus far found only in fruit.

TYPIFICATION: The species is based on *Smith 1715* (US 1676291 HOLOTYPE; many ISOTYPES), collected May 7, 1934, in the lower Wainunu River valley, Mbua Province, Vanua Levu.

DISTRIBUTION: Endemic and known only from the type collection, which, however, seems sharply distinct from its congeners in the Fijian Region.

LOCAL NAME: *Ndrausasa*.

8. ARYTERA Bl. *Rumphia* 3: 169. 1849; Radlk. in *Pflanzenr.* 98 (IV. 165); 1268. 1933.

Monoecious trees or shrubs, the leaves paripinnate, the leaflets opposite or alternate, with subcoriaceous or chartaceous blades; inflorescences axillary, paniculate, the flowers unisexual, small, actinomorphic; calyx opening early, with 5 valvate or narrowly imbricate lobes, these not membranaceous at margin; petals 5 (sometimes absent or rudimentary in ♂ flowers), short-clawed, with broad, pilose, ecristate scales; stamens (6–) 8, the filaments and anthers sometimes pilose; disk annular; ovary subglobose to obovoid, not angled, 2- or 3-locular, each locule with 1 erect ovule, the style obvious, with small lobes; fruit capsular, loculicidally 2- or 3-valved, the lobes not winglike, the locules (in our species) copiously pilose within, the seeds ellipsoid, with a saccate, fleshy aril, this often narrowed at base and attached by a narrow ring around hilum and micropyle, sometimes folded within near base (but not in our species).

TYPE SPECIES: Blume based his genus upon two species, *Arytera litoralis* Bl. and *A. montana* Bl. (referred to *Lepidopetalum* by Radlkofer); no lectotype species is indicated in ING (1979).

DISTRIBUTION: Southeastern Asia through Malesia to Australia and eastward to Tonga and Samoa; the genus probably includes 24 species (Van der Ham, 1977) or more. A single species occurs in Fiji.

USEFUL TREATMENT OF GENUS: VAN DER HAM, R. W. J. M. Notes on *Arytera* (Sapindaceae). *Blumea* 23: 289–300. 1977.

Van der Ham's 1977 preliminary discussion of *Arytera* usefully points out distinctions between that genus and *Cupaniopsis*, genera which have sometimes been misunderstood and even not clearly distinguished from *Guioa* in the Fijian Region. The three genera at least in our area are seen to be readily separable when either flowers or fruits are available. *Guioa* (FIGURE 144A) and *Cupaniopsis* (FIGURE 145C) have the calyx opening late, with nearly free, broadly imbricate sepals, while that of *Arytera* (FIGURE 145A) opens early and has valvate or scarcely imbricate lobes, suggesting the calyx of *Elattostachys* (FIGURE 148E). Of the four genera, only *Guioa* (FIGURE 144B) has petals with cristate scales, although this character is not always obvious. The fruits of *Guioa* have compressed lobes with thickened margins (FIGURE 144C), the locules within and the obvious septa being glabrous, and the seeds have arils (FIGURE 143B) often exceeding the seeds in length and distally appendaged. In contrast, the other three genera of this relationship have fruits with rounded (or at least not winglike) lobes, the locules within and the septa being copiously pilose (FIGURES 146A & C, 147A, 148B), at least in our area. The seeds of *Arytera* have arils (FIGURE 146B) attached by a narrow, often contracted base, while the arils of *Cupaniopsis* (FIGURES 146D, 147D) and *Elattostachys* (FIGURE 148C) are rounded at base and attached by a broad ring. The septa in *Cupaniopsis* fruits are incomplete, either reduced to negligible ridges median within each valve (FIGURE 146C) or partial (FIGURE 147A) or meeting in the center but not fused. Our species of *Arytera* (FIGURE 146B) and *Elattostachys* (FIGURE 148B) have complete septa, although these are often readily separable in the center.

In vegetative characters our sole species of *Arytera* is readily recognized by the minute peltate scales on the inflorescence branches, capsules, lower leaflet surfaces, etc. Such scales, when they occur at all in the other three genera mentioned above, are seldom persistent.

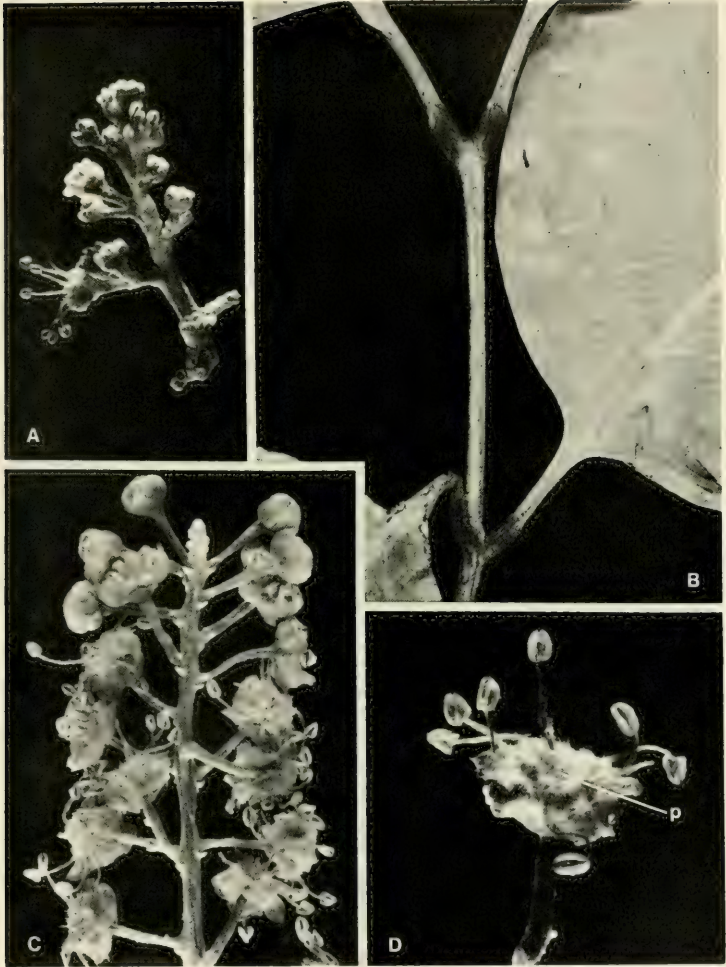


FIGURE 145. A, *Arytera brackenridgei*; distal portion of inflorescence branch and flowers, $\times 4$. B-D, *Cupaniopsis concolor*; B, distal portion of leaf rachis (upper surface) and leaflet bases, $\times 2$; C, distal portion of inflorescence branch and flowers, $\times 4$; D, σ flower (1 anther fallen), showing pistillode (p), $\times 8$. A from Smith 1454, B from Smith 4490, C & D from Gillespie 4794.

1. *Arytera brackenridgei* (A. Gray) Radlk. in Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 9: 510, 513, 555. 1879; Burkill in J. Linn. Soc. Bot. 35: 33. 1901; Radlk. in Pflanzenr. 98 (IV. 165): 1286. 1933; Yuncker in Bishop Mus. Bull. 220: 176. 1959; J. W. Parham, Pl. Fiji Isl. 173. 1964, ed. 2. 245. 1972.

FIGURES 145A, 146A & B.

- Cupania brackenridgei* A. Gray, Bot. U. S. Expl. Exped. 1: 255. 1854; Walp. Ann. Bot. Syst. 4: 380. 1857; Seem. Viti, 434. 1862, Fl. Vit. 46. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 143. 1890.
Arytera samoensis Radlk. in Denkschr. Akad. Wiss. Wien 85: 305. 1910, in Pflanzenr. 98 (IV. 165): 1286. 1933; Christophersen in Bishop Mus. Bull. 128: 133. 1935.
Cupaniopsis sp. Guillaumin in J. Arnold Arb. 12: 242. 1931.
Cupaniopsis aneityensis Guillaumin in J. Arnold Arb. 14: 56. 1933.
Guioa subfalcatata sensu A. C. Sm. in Bishop Mus. Bull. 141: 89. 1936; non Radlk.

In Fiji *Arytera brackenridgei* occurs from near sea level to an elevation of about 1,050 m. in various types of forest, the forest-grassland transition, on open hillsides, and in thickets, sometimes along coasts. It is noted as a tree 4–25 m. high, sometimes with a spreading crown, with a yellow calyx, white filaments, pale green or pale yellow anthers, and orange-red seeds. The leaflets are usually 5–8, sometimes fewer, with ovate- to oblong-lanceolate blades 5–12 (–14) × 1.3–5 (–6) cm. drying dark green to brown. Foliage, inflorescence branches, and capsules bear subsistent, minute (requiring high magnification), peltate scales. The pedicels at anthesis are 1–2 mm. long and the calyx lobes are about 0.5 × 0.8 mm.; the mature fruits are obovoid, usually 2-locular, 10–17 × 13–17 mm., with seeds 8–10 × 4–6 mm. Flowers and fruits have been obtained at all seasons.

TIPIFICATION AND NOMENCLATURE: *Cupania brackenridgei* is based on *U. S. Expl. Exped.* (US 1773 HOLOTYPE), collected in 1840 on Ovalau. *Arytera samoensis* is typified by *Rechinger 675* (W HOLOTYPE; photo at BISH), from between Aopo and Asau, Savai'i, Samoa. Although the latter has previously been maintained as distinct, I find no differentiating characters among the several available collections from Samoa. *Cupaniopsis aneityensis* is based on *Kajewski 827*, p. p. (or *827A*) (ISOTYPE at BISH), collected Feb. 28, 1929, at Anelgauhat Bay, Aneityum, New Hebrides. Additionally, *Kajewski 386* (Eromanga), listed by Guillaumin in 1931, seems to represent *Arytera brackenridgei*.

DISTRIBUTION: New Hebrides to Tonga and Samoa. I have examined about 50 Fijian collections from eight islands, but the species may be anticipated on many others.

LOCAL NAMES AND USE: Recorded names are *masa*, *marasa*, *ndrausasa*, *rausasa*, *ravulevu*, *ndrengandrenga*, and *kauloa*; I would question the last of these. The timbers are sometimes used for houseposts.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Nangua, *St. John 18115*. VITILEVU: MBA: Slopes of Mt. Nairoso, eastern flank of Mt. Evans Range, *Smith 4064*; Naloto Range, *DA 14767*; vicinity of Nandariavatu, *Parks 20709*. NANDRONGA & NAVOSA: Southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, *Smith 4562*. NAMOSI: Northern slopes of Korombasambasanga Range, in drainage of Wainavindrau Creek, *Smith 8754*. RA: Mataimeravula, vicinity of Rewasa, near Vaileka, *Degener 15346*. NAITASIRI: Viria, *Meebold 16668*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7174*; vicinity of Ndravuni, *DA 12472* (*DF 121*, *Bola 23*). OVALAU: Slopes of Mt. Koronimoko, vicinity of Thawathi, *Smith 8081*. NGAU: Hills east of Herald Bay, inland from Sawaieke, *Smith 7759*. VANUA LEVU: MBUA: Ndama road, *DA 16691*. MATHUATA: Near Mbatri, Ndreketi River, *DA 13911*; Undu Point, *Tothill 85*. THAKAUDROVE: Waivula, *Krauss 1016*. TAVEUNI: Above Somosomo, *Gillespie 4831*. VANUA MBALAVU: Namalata Islet, southern limestone section, *Smith 1454*. ONGEA NDRIKI: *Bryan 413*.

Cupaniopsis neo-ebudensis Guillaumin (in J. Arnold Arb. 12: 241. 1931), typified by *Kajewski 381* (BISH ISOTYPE) from Eromanga, New Hebrides, seems referable to

Arytera, although it appears to differ from *A. brackenridgei* in the sparsity of its peltate scales, the copious, strigose indument of its pedicels and calyx, and its copiously pilose filaments.

9. CUPANIOPSIS Radlk. in Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 9: 483, 498. 1879, in Pflanzenr. 98 (IV. 165): 1177. 1933; A. C. Sm. in J. Arnold Arb. 31: 293. 1950.

Monoecious trees or shrubs, the leaves paripinnate, the leaflets alternate, with subcoriaceous or chartaceous blades; inflorescences axillary, paniculate and often ample, infrequently racemose (but not compactly so), the flowers actinomorphic; calyx opening late, with 5 nearly free lobes, these broadly imbricate, 2-seriate, membranaceous at margin, the 2 outer ones the smallest but enveloping young buds; petals 5, small, sessile, with pilose, ecristate scales; stamens 5-10 (in our species 8-10), the filaments filiform, pilose proximally; disk annular, flattened or pulvinate; ovary in ♀ flowers subglobose to trigonous-ovoid or -obovoid, 3-locular, each locule with 1 erect ovule, the style short, with small lobes; fruit capsular, globose or ovoid to ellipsoid or obovoid-trigonous, loculicidally 3-valved, sometimes unilocular and 1-seeded (in our species but 2- or 3-seeded in others of this alliance) with negligible septa within valves, sometimes 3-locular and 3-seeded with incomplete or complete (but not centrally fused) septa, the valves within and the septa (in all our species) copiously pilose, the seeds globose to ellipsoid, with a partial or nearly complete, thin aril rounded at base and attached by a broad ring around hilum and micropyle.

TYPE SPECIES: No choice of a lectotype species is indicated in ING (1979).

DISTRIBUTION: Probably about 60 species are referable to the genus, which occurs from eastern Malesia and Australia to Fiji and Samoa. Four endemic Fijian species are here recorded.

KEY TO SPECIES

- Mature fruits ovoid to ellipsoid, 16-25 × 12-18 mm., glabrous without, obtuse at base, estipitate, unilocular, 1-seeded, the septa reduced to median ridges within valves, the seeds 10-20 × 8-15 mm.; young foliage glabrous but with sparse, minute, evanescent scales (these also on youngest capsules); leaves glabrous, with 4-6 leaflets, these with ovate to elliptic blades 7-20 × 3-9 cm. drying greenish yellow or pale brown, the veinlet reticulation copious, fine, and prominulous on both surfaces; inflorescences paniculate with few branches or infrequently racemose (but not compactly so), the flowers often borne singly, the inflorescence branches and pedicels obscurely puberulent and soon glabrate; pedicels at anthesis 2-5 mm. long; flowers at anthesis about 5 mm. in diameter, the sepals ovate-suborbicular, 1.5-3 mm. long and broad, the ovary essentially glabrous. 1. *C. concolor*
- Mature fruits obovoid-trigonous, 12-28 mm. long and broad, copiously velutinous-puberulent or -hispidulous without, usually stipitate but sometimes shortly so and appearing essentially obtuse at base, 3-locular (septa sometimes complete but readily separable in center, sometimes partial), 3-seeded, the seeds 8-18 × 5-12 mm.; foliage, capsules, etc., lacking scales even when young; leaves with (8-) 10-20 leaflets, these with blades sometimes pilose beneath, drying brown or greenish brown, sometimes olivaceous above, the veinlet reticulation comparatively coarse; inflorescences paniculate, often elongate and many-branched, the flowers borne a few together on ultimate short branchlets, the indument of inflorescence branches and pedicels obvious; pedicels at anthesis 1-3 mm. long; flowers at anthesis usually 8-9 mm. in diameter, the sepals obovate, 3-5.5 mm. long and broad (outer 2 smaller), the ovary copiously sericeous-puberulent or setulose.
- Leaflet blades glabrous beneath or the indument, if present, inconspicuous and limited to nerves and nerve axils.
- Inflorescence branches tomentellous with hairs 0.2-0.5 mm. long, the calyx lobes sericeous without; leaflet blades usually 10-27 × 4-10 cm., acuminate or long-cuspidate at apex, the secondary nerves 8-15 pairs. 2. *C. leptobotrys*
- Inflorescence branches and calyx lobes minutely puberulent; leaflet blades 5-11 × 2-3.7 cm., rounded or obtusely short-cuspidate at apex, the secondary nerves 5-9 pairs. 3. *C. amoena*
- Leaflet blades uniformly soft-pilose beneath with pale, ferruginous or canescent, spreading hairs. 4. *C. vitiensis*

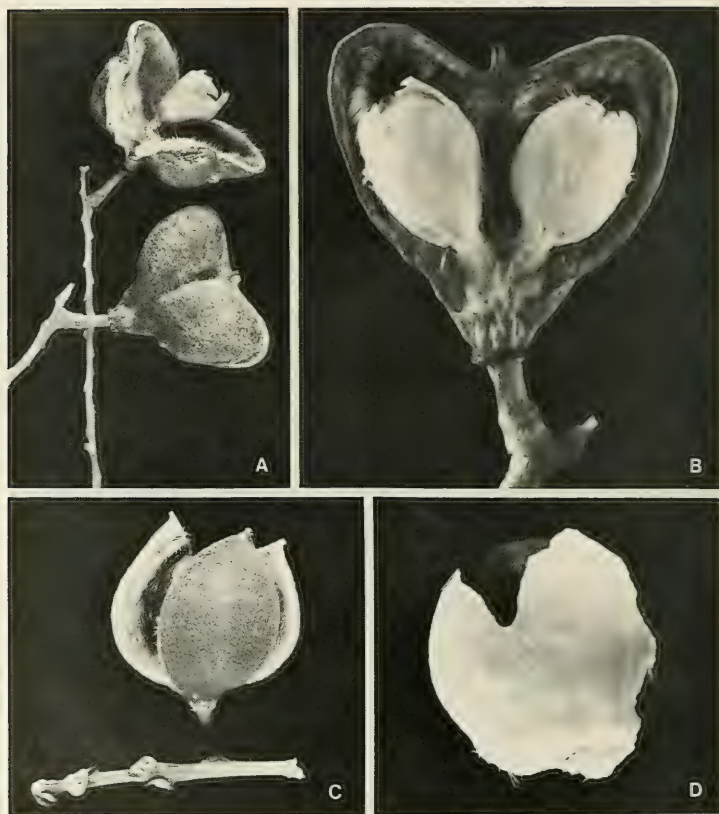


FIGURE 146. A & B, *Arytera brackenridgei*; A, fruits, the upper one with a single dehiscent locule, showing copious indument within and covering aril, $\times 2$; B, longitudinal section of fruit with 2 seeds in position, showing aril contracted at base around hilum, $\times 4$. C & D, *Cupaniopsis concolor*; C, unilocular fruit with a single seed, showing copious indument of inner surfaces of valves, $\times 2$; D, seed, showing aril broadly rounded at base around hilum, $\times 4$. A & B from *Smith 7759*, C & D from *Smith 4490*.

1. *Cupaniopsis concolor* (Gillespie) Van der Ham in *Blumea* 23: 290, solum quoad basionymum et spec. vit. 1977. FIGURES 145B-D, 146C & D.

Guioa concolor Gillespie in *Bishop Mus. Bull.* 83: 17, fig. 19. 1931; Radlk. in *Pflanzenr.* 98 (IV. 165): 1503. 1934.

Arytera concolor A. C. Sm. in *J. Arnold Arb.* 31: 298. 1950; J. W. Parham, *Pl. Fiji Isl.* 173. 1964, ed. 2. 245. 1972.

Cupaniopsis concolor occurs in dense, dry, or secondary forest at elevations of 50-1,150 m. as an often slender tree 3-18 m. high, with white petals and a fruit that remains green for an extended period, finally becoming brownish. Flowers have been obtained between September and March, fruits in nearly every month.

TYPEFICTION: The type of *Guioa concolor* is *Gillespie 4794* (BISH HOLOTYPE; ISOTYPES at BISH, GH, K, US), collected March 3, 1928, in the vicinity of Waiyevo, Taveuni.

DISTRIBUTION: Endemic to Fiji and thus far known only from the three largest islands, from which I have examined 22 collections.

LOCAL NAMES: Recorded names are *marasa*, *tombilito*, *sauva*, *nduvunduvu*, and *sorovula*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nalotawa, eastern base of Mt. Evans Range, *Smith 4490*; Savundamatau Creek, west of Nandarivatu, *Webster & Hildreth 14259*; Mt. Nanggara-nambuluta, east of Nandarivatu, *DA 13945*; western and southern slopes of Mt. Tomanivi, *Smith 5287*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 15625*; northern portion of Rairaimatuku Plateau, between Nandrau and Nanga, *Smith 5580*. RA: Saulangitua, vicinity of Rewasa, near Vaileka, *Degener 15508*. VANUA LEVU: THAKAUNDROVE: Navonu Creek, Natewa Peninsula, *DA 15091*. TAVEUNI: Vicinity of Waiyevo, *Gillespie 4793*; vicinity of Wairiki, *Gillespie 4765*; slopes of Mt. Manuka, east of Wairiki, *Smith 8135*.

Cupaniopsis concolor is not a close relative of the remaining three Fijian species of the genus but is comparable to *C. samoensis* Christophersen (in *Bishop Mus. Bull.* **154**: 14. fig. 4, 5. 1938). In contrast to *C. concolor*, however, the Samoan endemic has leaflet blades averaging slightly smaller (6–14 × 2.5–5 cm.), larger flowers (5–7 mm. in diameter at anthesis) with sepals as much as 3 × 4 mm., and a much larger mature fruit (35–50 × 30–40 mm.). The seeds of the Samoan plant are apparently two or three, in size perhaps larger at full maturity than those of *C. concolor*. The two species agree in having the fruit valves copiously pilose within and with an inconspicuous septal ridge, but it is of interest that the Samoan species should show such a strikingly larger fruit, reminiscent of the situation noted in *Alectryon*.

Van der Ham's reference of *Guioa concolor* to *Cupaniopsis* no doubt indicates the most reasonable position for this unusual species, but his inclusion of *Mischocarpus guillauminii* Kanehira (in *Bot. Mag. (Tokyo)* **46**: 672. 1932) in the same specific concept is certainly incorrect. That Caroline Islands species (represented at BISH by the same three collections listed by Van der Ham in 1977) has leaflets like the largest known for *C. concolor* but with more definitely ascending and curved secondaries; its fruits and seeds are larger (but the fruit is still smaller than that of *C. samoensis*); and its fruit valves are glabrous within, this surely providing a character of striking specific consequence. Presumably a new combination in *Cupaniopsis* is required for *Mischocarpus guillauminii*; Fosberg, Sachet, and Oliver (in *Micronesica* **15**: 152. 1979) listed the Caroline Islands species as *C. concolor*.

2. *Cupaniopsis leptobotrys* (A. Gray) Radlk. in *Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München* **9**: 519, 530, 585. 1879, in *Pflanzenr.* **98**: (IV. 165): 1197. 1933; A. C. Sm. in *J. Arnold Arb.* **31**: 294. 1950; J. W. Parham, *Pl. Fiji Isl.* **173**. 1964, ed. 2. 246. 1972. FIGURE 147A.

Cupania leptobotrys A. Gray, *Bot. U. S. Expl. Exped.* **1**: 255. 1854; *Seem. Viti*, 434. 1862, *Fl. Vit.* **46**. 1865; *Drake*, *Ill. Fl. Ins. Mar. Pac.* **143**. 1890.

Cupania apetala sensu *Seem.* in *Bonplandia* **9**: 254. 1861, *Viti*, 434. 1862; A. Gray in *Bonplandia* **10**: 35. 1862, in *Proc. Amer. Acad. Arts* **5**: 316. 1862; non *Labill.*

Ratonia storckii *Seem.* *Fl. Vit.* **47**. 1865.

Cupaniopsis storckii *Radlk.* in *Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München* **9**: 530, 587. 1879, in *Pflanzenr.* **98** (IV. 165): 1197. 1933; J. W. Parham, *Pl. Fiji Isl.* **173**. 1964, ed. 2. 246. 1972.

Matayba storckii *Drake*, *Ill. Fl. Ins. Mar. Pac.* **144**. 1890.

This most frequent species of *Cupaniopsis* in Fiji occurs from near sea level to about 1,100 m. in dense or medium forest and in crest thickets. It is noted as a tree or

shrub 2-10 m. high, usually slender, and with the leaves and inflorescences often aggregated at the summit. The leaves are usually 60-150 cm. long, with petiolules 15-30 mm. long; the inflorescences are usually pendulous and large, up to 150 cm. in length, with brown to greenish white sepals, white petals and filaments, and yellow anthers. The fruits are 15-28 mm. long and broad, becoming orange-yellow to brown, and the seeds are as large as 18×12 mm., with pale orange arils. Flowers and fruits have been obtained between April and October.

TYPIFICATION AND NOMENCLATURE: The type of *Cupania leptobotrys* is *U. S. Expl. Exped.* (US 17731 & 17732 HOLOTYPE; ISOTYPES at GH, K), collected on Ovalau in 1840. *Ratonia storckii* is typified by *Seemann 67* (K HOLOTYPE; ISOTYPE at GH), obtained in 1860 also on Ovalau. I am unable to find any significant differences between the two collections.

DISTRIBUTION: Endemic to Fiji and thus far known from four of the high islands; about 30 collections have been examined.

LOCAL NAMES AND USE: *Malatawa*, *malawathe*, *malawathi*, and *ndawandawa* have been recorded; in Ra it has been noted that an infusion of crushed bark is used for stomach trouble.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mt. Mangondro, *DA 14798*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 12651* (*Melville et al. 7024*); southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, *Smith 4570*. NAMOSI: Mt. Naitarandamu, *Gillespie 3317*; vicinity of Namuamua, *Gillespie 3005*; hills near Navua River, *Greenwood 1033*. RA: Tuvavatu, vicinity of Rewasa, near Vaileka, *Degener 15371*. NAITASIRI: Vicinity of Nasonggo, *DA 15315*; vicinity of Tamavua, *Gillespie 2447*. REWA: Mt. Korombamba, *DA 16533*. KANDAVU: Hills above Namalata and Ngaloa Bays, *Smith 154*. OVALAU: Summit of Mt. Ndelaiovalau and adjacent ridge, *Smith 7569*. VANUA LEVU: MBUA: Southern slope of Mt. Seatura, *Smith 1639*. MATHUATA: Mt. Ndelaikoro, *DA 11499*. THAKAUNDROVE: Hills south of Natewa, Natewa Peninsula, *Smith 1954*.

3. *Cupaniopsis amoena* A. C. Sm. in *J. Arnold Arb.* 31: 295. 1950; *J. W. Parham*, Pl. Fiji Isl. 173. 1964, ed. 2. 246. 1972. FIGURE 147B-D.

A sometimes slender tree 5-25 m. high, occurring in dense forest or crest thickets at elevations of 150-1,050 m. The leaves do not exceed 40 cm. in length, with petiolules 5-23 mm. long; the inflorescences are comparatively compact, spreading, up to 30 cm. in length; flowers have the petals and filaments white, the anthers orange or yellow, and the disk white. Fruits become brownish at maturity and do not exceed a size of 15×15 mm., with seeds up to 8×6 mm. The few available specimens indicate the presence of flowers and fruits between April and June.

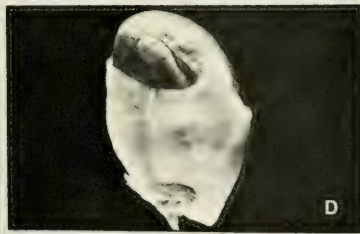
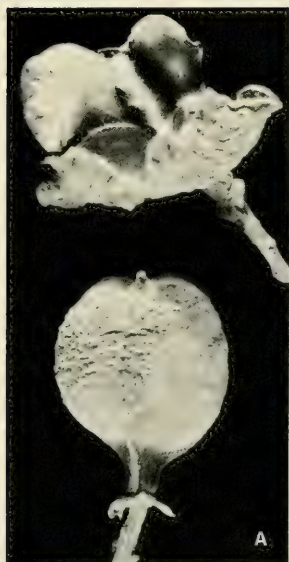
TYPIFICATION: The type is *Smith 4083* (A HOLOTYPE; many ISOTYPES), collected April 28, 1947, on the slopes of Mt. Nairoso, eastern flank of Mt. Evans Range, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known from only seven collections, all from Viti Levu.

LOCAL NAMES: *Ndrengandrenga*, *vusavusa*.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mt. Evans Range, *Greenwood 438*; eastern slopes of Mt. Koroyanitu, Mt. Evans Range, *Smith 4149*; slopes of Mt. Nairoso, eastern flank of Mt. Evans Range, *Smith 4105*; slopes of Mt. Yoo, west of Nandarivatu, *Webster & Hildreth 14138*; southern slopes of Mt. Ndelainathovu, on escarpment west of Nandarivatu, *Smith 4935*. NAITASIRI: Vicinity of Tholo-i-suva, *DA 10256*.

FIGURE 147. A, *Cupaniopsis leptobotrys*; fruits, the upper one dehiscent, showing incomplete, copiously pilose septa and a single remaining seed with aril, $\times 2$. B-D, *Cupaniopsis amoena*; B, distal portion of leaf rachis (upper surface) and leaflet bases (lower one showing lower surface), $\times 2$; C, fruits, one dehiscent and showing apices of seeds and aril lobes, $\times 2$; D, seed and aril, showing aril broadly rounded at base around hilum, $\times 4$. E, *Cupaniopsis vitiensis*; dehiscent fruit, showing 3 seeds and arils, the septa concealed, $\times 2$. A from *Gillespie 3317*, B from *Smith 4083*, C & D from *Smith 4935*, E from *Meebold 16721*.



4. *Cupaniopsis vitiensis* Radlk. in Repert. Sp. Nov. 20: 34. 1924, in Pflanzentr. 98 (IV. 165): 1198. 1933; A. C. Sm. in J. Arnold Arb. 31: 298. 1950; J. W. Parham, Pl. Fiji Isl. 173. 1964, ed. 2. 246. 1972. FIGURE 147E.

Cupaniopsis induta A. C. Sm. in J. Arnold Arb. 31: 296. 1950; J. W. Parham, Pl. Fiji Isl. 173. 1964, ed. 2. 246. 1972.

Cupaniopsis sp. A. C. Sm. in J. Arnold Arb. 31: 297. 1950.

Tree 2–15 m. high, often slender, found in dense or dry forest or in the forest-grassland transition from near sea level to an elevation of about 1,200 m. Leaves have been noted up to 100 cm. in length, with petiolules 10–30 mm. long and oblong-lanceolate to broadly oblong-elliptic leaflet blades (8–) 10–25 (–34) × (3–) 3.5–12 cm., these short-cuspidate to acute or rarely obtuse at apex. The inflorescences may be as long as 40 cm.; the flowers have brownish sepals, white petals and filaments, and yellow or orange anthers. The brownish yellow fruits are 15–28 mm. long and broad, with seeds 10–18 × 7–12 mm. Flowers and fruits have now been observed in months scattered throughout the year.

TYPIFICATION AND NOMENCLATURE: Radlkofer's species is based on *Horne 982* (K HOLOTYPE), collected in August, 1878, near Korosuli ("Kow Luli" as transcribed by Radlkofer), a village on the Wainimala River not far from its mouth, Naitasiri Province, Viti Levu, mentioned by Horne in *A Year in Fiji*, 46. 1881. The type of *Cupaniopsis induta* is *Smith 4663* (A HOLOTYPE; many ISOTYPES), collected June 3, 1947, on the upper slopes of Mt. Koromba, Mba Province, Viti Levu. In describing the latter species I indicated its probable alliance to *C. vitiensis*, then inadequately known only from the fragmentary type and from *Meebold 16721*, suspected also to represent it. Collections since accumulated suggest that the leaflet blade variation indicated in my 1950 key (p. 294) and differences in the capsule base (whether obviously stipitate or essentially obtuse) are inadequate to permit the recognition of two taxa of this immediate relationship.

DISTRIBUTION: Endemic to Fiji and thus far known only from the two largest islands and 19 collections, all here listed.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Hills between Nggaliwana and Nandala Creeks, south of Nauwanga, *Smith 5854*; slopes of Mt. Tomanivi, *Gillespie 4094*, *DA 7080*, *14654*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 13316*, *13395*. SERUA: Inland from Navutulevu, *Howard 53*. NAITASIRI: Vicinity of Nanduna, Waindina River, *DA 13234*; vicinity of Viria, *Meebold 16721*; Tamavua-Sawani road, *Setchell & Parks 15165*; vicinity of Nasinu, *Gillespie 3659*. VANUA LEVU: MBUA: Mt. Uluimbau, near Ndriti, *DA 15194*; lower Wainunu River valley, *Smith 1742*. MATHUATA: Ndreketi River, *DA 13457*; vicinity of Natua, *DA 12861*; Savusomo, *DA 12911*; Ndongotuki Tikina, *Howard 147*.

10. *ELATTOSTACHYS* Radlk. in Actes Congr. Internat. Bot. Amsterdam 1877: 82, 107, 112. 1879, in Pflanzentr. 98 (IV. 165): 1258. 1933.

Cupania sect. *Elattostachys* Bl. Rumphia 3: 160, p. p. 1849.

Monoecious trees or shrubs, the leaves paripinnate, the leaflet blades oblong to ovate-lanceolate, subcoriaceous, often somewhat falcate, in our species essentially entire; inflorescences axillary, racemose or paniculate with racemiform branches, the flowers compactly arranged in bud, unisexual, actinomorphic; calyx deeply 5-lobed, the lobes narrowly imbricate in bud, soon spreading; petals 5, inconspicuous, clawed, with pilose, ecristate scales; stamens 8, conspicuous in ♂ flowers, the filaments filiform, glabrous, the anthers large; disk annular, glabrous; ovary in ♀ flowers trigonous-ovoid, 3-locular, each locule with 1 erect ovule, the style short, the stigmas inconspicuous; fruit capsular, subglobose or obovoid-trigonous, loculicidally 3-valved, the locules within and the septa copiously pilose (at least in our species), the septa complete but readily separating from one another at maturity, the seeds ellipsoid or obovoid, shining, with a thin, lobed aril (in our species extending above middle of seed) attached by a rounded base.

TYPE SPECIES: Blume's section, raised to generic rank by Radlkofer, included four species. No lectotypification is proposed in ING (1979), but from Radlkofer's 1879 discussion it would seem that either *Elattostachys zippeiana* (Bl.) Radlk. or *E. verrucosa* (Bl.) Radlk. should be taken to lectotypify the genus.

DISTRIBUTION: Malesia and Australia to Tonga, Niue, and Samoa, probably with about 15 species. Two species are found in Fiji, one of them endemic.

KEY TO SPECIES

Branchlets, petioles, rachis, leaflet nerves beneath, and fruits sparsely strigillose, soon glabrate; leaflet blades prevalently lanceolate or ovate-lanceolate, usually inaequilateral and obviously falcate, 7-18 × 1.5-5 (-6) cm., with 9-16 secondary nerves per side; fruits 10-15 mm. long and broad at maturity.

1. *E. falcata*

Branchlets, petioles, rachis, leaflet nerves beneath, and fruits pilose with spreading and persistent brown hairs; leaflet blades oblong-lanceolate, not falcate, 12-18 × 3.5-5.5 cm., with 12-19 secondary nerves per side; fruits 17-20 mm. long and broad at maturity. 2. *E. venosa*

1. *Elattostachys falcata* (A. Gray) Radlk. in Actes Congr. Internat. Bot. Amsterdam 1877: 112. 1879, in Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 9: 514, 531, 602. 1879, in Pflanzenr. 98 (IV. 165): 1266. 1933; Christophersen in Bishop Mus. Bull. 154: 17. 1938; Yuncker in op. cit. 178: 78. 1943, in op. cit. 220: 175. 1959; J. W. Parham, Pl. Fiji Isl. 174. 1964, ed. 2. 246. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 186. 1970; P. S. Green in Bramwell, Plants and Islands, 45. 1979. FIGURES 94 (upper), 148A-C.

Cupania falcata A. Gray, Bot. U. S. Expl. Exped. 1: 252. 1854; Walp. Ann. Bot. Syst. 4: 380. 1857; Seem. in Bonplandia 9: 254. 1861, Viti, 434. 1862; A. Gray in Bonplandia 10: 35. 1862, in Proc. Amer. Acad. Arts 5: 316. 1862.

Cupania vitiensis Seem. in Bonplandia 9: 254, nom. nud. 1861, Viti, 434, nom. nud. 1862.

Ratonia falcata Seem. Fl. Vit. 47. 1865.

Ratonia vitiensis Seem. ex F. v. Muell. Fragm. Phyt. Austral. 9: 96, pro syn. 1875; Radlk. in Pflanzenr. 98 (IV. 165): 1266, pro syn. 1933.

Elattostachys vitiensis Radlk. in Actes Congr. Internat. Bot. Amsterdam 1877: 112, nom. nud. 1879, in Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 9: 526, 531, 602. 1879, in Pflanzenr. 98 (IV. 165): 1266. 1933; Guillaumin in J. Arnold Arb. 14: 56. 1933; J. W. Parham, Pl. Fiji Isl. 174. 1964, ed. 2. 246. 1972.

Matayba falcata Drake, Ill. Fl. Ins. Mar. Pac. 143. 1890.

In Fiji *Elattostachys falcata* is a frequent component of the forest, strikingly different from members of related genera in the racemiform branches of its inflorescences, which when immature appear spikelike and bear brilliantly colored anthers that conceal the small petals. It is found from near sea level to about 1,100 m. in dense, thin, or open forest or on its edges and in grassland thickets, as a tree 5-25 m. high, often spreading or slender, with a trunk to 60 cm. in diameter. Its calyx is yellowish or pale green, its petals and anthers bright red to purple, its filaments varying from pale pink to purple, its disk orange or yellowish, its gynoecium green with a pinkish style, and its fruits green turning to brown. Flowering and fruiting material is seen throughout the year.

TYPIIFICATION AND NOMENCLATURE: Two basionyms are involved in the above synonymy; for *Cupania falcata* Gray listed the localities as Ovalau and Somosomo (on Taveuni), but the available sheets cannot be definitely assigned to either locality. The type is *U. S. Expl. Exped.* (US 17734 LECTOTYPE, in flower; putative ISOLECTOTYPES at GH, K); a second collection is *U. S. Expl. Exped.* (US 26555, in fruit, K). The second basionym is *Cupania vitiensis* Seem., which was never validly published; *Elattostachys vitiensis* must be considered a new species dating from Radlkofer's second publication of 1879 (p. 602, description). The type of this is *Seemann 68* (B (?), BM, G, K LECTOTYPE here designated), collected in 1860 near Port Kinnaird, Ovalau. Seemann himself (1865) synonymized *Cupania vitiensis* with Gray's species under the name *Ratonia*

falcata. The Seemann type has the leaflet blades scarcely falcate, slightly larger and proportionately broader than those of typical *E. falcata*, but there is a complete



FIGURE 148. A-C, *Elattostachys falcata*; A, distal portion of leaf rachis (upper surface) and leaflet bases, $\times 2$; B, fruits, the upper one dehiscent and with seeds fallen, showing indument of inner surfaces of locules, $\times 2$; C, seed and aril, $\times 4$. D-F, *Elattostachys venosa*; D, distal portion of inflorescence and flowers, $\times 4$; E, ♀ flower, 1 petal projecting forward between 2 calyx lobes, showing disk, filaments (anthers fallen), and developing gynoecium, $\times 8$; F, fruit, $\times 2$. A from Smith 47, B from Gillespie 4585, C from St. John 18272, D & E from DF 949, F from Smith 604.

transition between the extremes, and the foveolate or efoveolate leaflet character utilized by Radlkofer is undependable.

DISTRIBUTION: New Hebrides to Tonga, Niue, and Samoa. It is abundant in Fiji, now known from more than 80 collections from ten islands, but doubtless to be expected on many other islands.

LOCAL NAMES AND USES: This very distinct taxon passes under many local names: *marasa*, *masa*, *masamasa*, *ndrausasa*, *ndrengandrenga*, *tandiri*, *wewe*, *vakatasi*, *vure*, *kailo*, and *tarawaukeikaka*. It is considered a timber tree and is useful in house-building, also furnishing firewood; formerly the wood was used for making war clubs. The bright inflorescences are sometimes used in necklaces.

REPRESENTATIVE COLLECTIONS: YASAWAS: YANGGETA: *Weiner 246*. WAYA: Nangua, *St. John 18169*. VITI LEVU: MBA: Mt. Evans Range, *Greenwood 1165*; Naloto Range, *DA 14777*; upper slopes of Mt. Koromba, *Smith 4648*; vicinity of Nandarivatu, *Degener 14721*; slopes of Mt. Tomanivi, *Smith 5117*. NANDRONGA & NAVOSA: Nausori Highlands, *DF 217 (Watkins 782)*; vicinity of Mbelo, near Vatukarasa, *Degener 15306*. SERUA: Hills east of Navua River, near Nukusere, *Smith 9133*. NAMOSI: Summit of Mt. Voma, *Gillespie 2741*. RA: Vicinity of Rewasa, near Vaileka, *Degener 15370*. NAITASIRE: Rarandawai, Wainamo-Wainisavulevu divide, *St. John 18272*; Central road, *Tothill 512*. TAILEVU: Near Ngegelekuero, *DA 13610*. REWA: On limestone near Lami, *Gillespie 4585*. KANDAVU: *Seemann 70*; hills above Namalata and Ngaloa Bays, *Smith 47*. OVALAU: Hills east of Lovoni Valley, *Smith 7682*. VANUA LEVU: MBUA: Southern portion of Seatovo Range, *Smith 1532*. MATHUATA: Vicinity of Lambasa, *Greenwood 488*. THAKAUNDOVE: Eastern drainage of Yanawai River, *Degener & Ordonez 14098*; between Salt Lake and Natewa Bay, *Bierhorst F198*. TAVEUNI: Vicinity of Waiyevo, *Gillespie 4660*; slopes of Mt. Manuka, east of Wairiki, *Smith 8314*. VANUA MBALAVU: Slopes of Korolevu, near Lomaloma, *Garnock-Jones 1041*. LAKEMBA: Near Tumbou Jetty, *Garnock-Jones 784*. ONGEA NDRIKI: *Bryan 406*.

2. *Elattostachys venosa* A. C. Sm. in Bishop Mus. Bull. **141**: 89. fig. 46. 1936; J. W. Parham, Pl. Fiji Isl. 174, as *E. venosus*. 1964, ed. 2. 246. 1972.

FIGURE 148D-F.

Tree 7-15 m. high, infrequent in dense forest at elevations of 100-700 m., known to bear flowers in December and fruits in March and November. The species was originally based on a single fruiting collection, but two more recent collections make desirable the following emendation of the earlier description.

Young parts and branchlets copiously puberulent and also very copiously brown-hispidulous with hairs to 0.5 mm. long, the branchlets at length glabrate; petioles 8-12 cm. long, with the rachis and petiolules copiously hispidulous (hairs to 0.8 mm. long), tardily becoming merely puberulent; leaflet blades above sometimes subpersistently pilose but at length glabrate, beneath copiously spreading-pilose (hairs brown or dull golden), only tardily becoming puberulent, very obviously tufted-pilose in axils of secondaries, these sometimes only 12 per side; inflorescences at anthesis to 15 cm. long, the branchlets, pedicels, and calyx copiously pilose with spreading golden hairs to 0.5 mm. long, the pedicels stout, 2-3 mm. long; calyx lobes oblong-deltoid, 1.2-1.5 mm. long, 0.7-1 mm. broad, subacute, also pilose within; petals ovate-deltoid, about 1 × 1.5 mm., densely villose within; filaments elongating to 1-2 mm., the anthers stout, oblong, 1.5-1.8 mm. long, present also in ♀ flowers and perhaps partially fertile but soon caducous; ovary trigonous, the style stout, about 0.8 mm. long, both copiously hispidulous with hairs 0.1-0.3 mm. long, the ♂ flowers with a large, hispidulous pistillode.

TYPIIFICATION: The type is *Smith 604* (BISH HOLOTYPE; many ISOTYPES), collected Nov. 28, 1933, on the southwestern slopes of Mt. Mbatini, Thakaundrove Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and known from only three collections from the two largest islands.

AVAILABLE COLLECTIONS: VITI LEVU: SERUA: Inland from Namboutini, *DF 949 (T. Lora 8)*, *DA L.22307 (DF 99, coll. A. Nasoqiri)*.

11. *KOELREUTERIA* Laxm. in *Novi Comment. Acad. Sci. Petrop.* **16**: 562. 1772; Radlk. in *Pflanzenr.* **98** (IV. 165): 1329. 1933; A. C. Sm. in *J. Arnold Arb.* **36**: 281. 1955; F. Meyer in op. cit. **57**: 137. 1976; A. C. Sm. in *Allertonia* **1**: 411. 1978.

Monococious trees, the leaves imparipinnate, in our species bipinnate and ample and with the ultimate leaflet blades chartaceous and subentire at maturity; inflorescences terminal, amply pyramidal-paniculate, the flowers asymmetric; calyx cupuliform, deeply 5-lobed, the lobes narrowly imbricate; petals 4 or 5 (or 6), unguiculate, squamate; stamens 8 (or 9), conspicuous in ♂ flowers, with villose filaments; disk oblique, swollen, lobulate; ovary triquetrous, incompletely 3-celled, each locule with 2 ovules, the style exerted, the stigma inconspicuously 3-lobed; fruit capsular, subovoid, inflated, conspicuously reticulate-veined, loculicidally 3-locular, the seeds by abortion solitary in each locule, exarillate.

TYPE SPECIES: *Koelreuteria paniculata* Laxm.

DISTRIBUTION: China, Taiwan, and Fiji. Most taxa are widely cultivated in gardens as ornamentals. Meyer (1976) accepts three species in the genus, but here I again recognize the strikingly disjunct Fijian population as a fourth species.

USEFUL TREATMENT OF GENUS: MEYER, F. G. A revision of the genus *Koelreuteria* (Sapindaceae). *J. Arnold Arb.* **57**: 129-166. 1976.

1. *Koelreuteria elegans* (Seem.) A. C. Sm. in *Contr. U. S. Nat. Herb.* **30**: 518. 1952, in *J. Arnold Arb.* **36**: 282. 1955; J. W. Parham, *Pl. Fiji Isl.* **174**. 1964, ed. 2. 247. 1972; F. Meyer in *J. Arnold Arb.* **57**: 156, solum quoad subsp. *elegans*. 1976; A. C. Sm. in *Allertonia* **1**: 411. 1978. FIGURE 94 (lower).

Melia sp. Seem. in *Bonplandia* **9**: 254. 1861.

Meliae sp. nov. Seem. *Viti*, 434. 1862.

Melia elegans Seem. *Fl. Vit.* **36**. 1865; Drake, *Ill. Fl. Ins. Mar. Pac.* **136**. 1890.

Koelreuteria formosana sensu A. C. Sm. in *Sargentia* **1**: 55. 1942; non Hayata.

Koelreuteria vitiensis A. C. Sm. in *J. Arnold Arb.* **31**: 299. 1950.

Koelreuteria elegans subsp. *elegans* F. Meyer in *J. Arnold Arb.* **57**: 158. fig. 6, 7, 13E, 14, 15. 1976.

The Fijian *Koelreuteria* occurs at elevations of 50-825 m. in dense or open forest or on its edges, in dry secondary forest, in wooded gullies, and on dry hillsides, as an often spreading tree 4-25 m. high. The petals are bright yellow, red toward base within, and the filaments are yellow; the fruit is reddish brown, pink-tinged when young and then becoming yellowish; the seeds at length are black and shining. Flowers and fruits have been collected between March and July.

TYPIFICATION AND NOMENCLATURE: *Melia elegans* is based on *Seemann 64* (κ HOLOTYPE; ISOTYPE at GH), collected in 1860 along the coast of Mathuata Province, Vanua Levu. The specimen was taken from a juvenile plant, and I overlooked its true identity in describing *Koelreuteria vitiensis*, of which the type is *Smith 4389* (A HOLOTYPE; many ISOTYPES), collected May 14, 1947, in flower and fruit, on the slopes of Mt. Nairoso, eastern flank of Mt. Evans Range, Mba Province, Viti Levu.

DISTRIBUTION: Collections of this endemic species since my earlier discussions (1950, 1952) confirm my opinion that it is indigenous in Fiji, derived from an ancient chance disseminule (1978). Some 24 Fijian collections have now been examined by me, all from the two large islands; all are here cited. Among the 20 specimens cited by Meyer (1976) are two that I have not seen.

LOCAL NAMES AND USES: Recorded names are *wiwi*, *manawi*, *towiwi*, *wiri*, *tatange*, and *lombolombo*. Foresters consider the species to produce useful timber, and an extract of the leaves has been used as a black hair dye.

AVAILABLE COLLECTIONS: VITI LEVU: Mba: Mountains inland from Lautoka, *Greenwood 450*; Naloto Range, *DA 14778*; Vuniyasi, *DA 2359*; Numbulekaleka, *DA 14725*; slopes of escarpment north of Nandari-

vatu, *Greenwood 450, Smith 6081*; vicinity of Nandarivatu, *Parks 20795, Gillespie 4181*; Wainambuka Valley, Nandarivatu, *Vaughan 3437*. NANDRONGA & NAVOSA: Vicinity of Nandrau, *DF 1185*; Nambosewale, vicinity of Nandrau, *DF 1171*; Tovua, Numbutautau, *DF 1191*; vicinity of Nakalavo, *H. B. R. Parham 283a, 283b*; Nathotholevu, near Singatoka, *H. B. R. Parham 301* (coll. *W. L. Parham*); head of Sovi River, *W. L. Parham 4*. RA: Mataimeravula, vicinity of Rewasa, near Vaileka, *Degener 15435*. TAILEVU: Near Nayavu, King's Road, *DA 1213*. VANUA LEVU: MATHUATA: Above Saivou Village, Seanggangga River, *Berry 24*; southern slopes of Mt. Numbuloo, east of Lambasa, *Smith 6429*. THAKAUNDRUVE: Ndrawa River, *DA 14327*. FIJI without further locality, *Horne s. n.*

Salient characters distinguishing *Koelreuteria elegans* from *K. formosana*, discussed by Meyer (1976) except for fruit characters, are the consistently shorter petioles, the leaflet blades essentially entire (rather than coarsely serrate) on mature plants, the comparatively long-clawed, broader petals with obtuse or rounded (rather than acute) apices, the longer filaments and styles, and the abruptly cuspidate (rather than retuse) capsule valves. Distinctions between the pollen of *K. elegans* and that of *K. formosana* were pointed out by Nowicke (in Meyer, 1976, p. 135). Whether such consistent differences suggest specific or subspecific status is of course a matter of personal judgment, but they seem to be the kind of differences that indicate separate evolutionary paths over an extended time period. I believe that one must be more than conservative to place such distinct taxa in a single species, especially in consideration of the minuscule area occupied by each and of the 7,000 km. that separates them.

12. *COSSIGNIA* Commerson ex Lam. *Encycl. Méth. Bot.* 2: 132, as *Cossinia*. 1786; corr. Juss. *Gen. Pl.* 248. 1789; Radlk. in *Pflanzenr.* 98 (IV. 165): 1337. 1933; A. C. Sm. in *J. Arnold Arb.* 36: 282. 1955; S. Reynolds in *Austrobaileya* 1: 485, as *Cossinia*. 1982.

Monoecious trees or shrubs, the indument composed of two types of stellate hairs (fine and sessile or coarse and stipitate), the leaves usually imparipinnate, with 3-7 leaflets, the rachis narrowly winged, the leaflet blades subsorbicaceous and entire; inflorescences terminal or axillary, thyrsoid, with cinnate ultimate cymules, the flowers obliquely symmetric, ♂ and ♀ borne in the same inflorescence; calyx deeply 5-lobed, the lobes imbricate, soon spreading; petals 4-6, shortly unguiculate, imbricate, membranaceous, esquamate; stamens 5-9, excentric, conspicuous in ♂ flowers (short and presumably sterile in ♀ flowers), with glabrous filaments; disk unilateral (regular only in the New Caledonian species), carnos; ovary obovate-triangular, 3-locular (reduced to a small pistillode in ♂ flowers), copiously pilose, each locule with 2 axile, superposed ovules, the style filiform, the stigma subcapitate; fruit capsular, trigonous, with inflated lobes, persistently pilose, loculicidally 3-valved, septifragal, with 2 (1 sometimes aborting) exarillate seeds borne in each locule, the style long-persistent.

LECTOTYPE SPECIES: *Cossignia pinnata* Commerson ex Lam. (vide S. Reynolds in *Austrobaileya* 1: 485. 1982); lectotypification was not suggested in ING (1979).

DISTRIBUTION: Four species, one each from the Mascarene Islands, Queensland, New Caledonia, and Fiji. Reynolds (1982) first described the Australian species and offered a key to the four, combining the second original species, *Cossignia triphylla* Commerson ex Lam., with *C. pinnata*.

USEFUL TREATMENT OF GENUS: REYNOLDS, S. T. *Cossinia*. *Austrobaileya* 1: 485-488. 1982.

Although the generic name was originally spelled *Cossinia* by Lamarck in 1786, it was intended to honor D. de Cossigni and therefore was corrected to *Cossignia* by Jussieu in 1789. The latter spelling has been adopted by Radlkofer and most subsequent users, including ING (1979). Airy Shaw (in Willis, *Dict. Fl. Pl. Ferns*, ed. 7. 290. 1966) retains the spelling *Cossinia*, presumably considering it an intentional Latinization, and this is followed by Reynolds (1982).

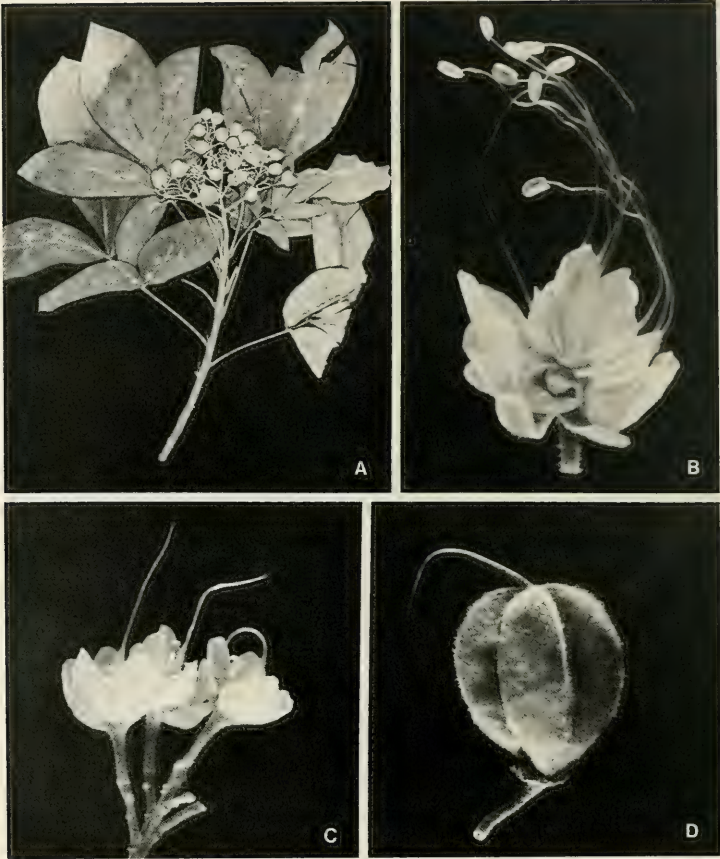


FIGURE 149. *Cossignia pacifica*: A, distal portion of branchlet, with foliage and an infructescence, $\times 1/4$; B, σ flower with 1 petal removed, showing 8 stamens, unilateral disk, and pistillode, $\times 4$; C, ultimate cluster of f flowers, $\times 2$; D, fruit just prior to dehiscence, $\times 2$. A & D from DA 13480, B & C from Smith 6432.

1. *Cossignia pacifica* A. C. Sm. in J. Arnold Arb. 31: 300. 1950, in op. cit. 36: 282. 1955;
J. W. Parham, Pl. Fiji Isl. 173. 1964, ed. 2. 246. 1972. FIGURE 149.

The endemic *Cossignia*, apparently rare and local, occurs in forest or on the edge of open forest at elevations of 100–200 m. (or perhaps higher), as a freely branching tree 5–12 m. high, with white petals and filaments, green fruits, and black seeds. The indument, with two types of stellate hairs, is copious and persistent on foliage parts, calyx, and fruits; however, the 5 or 6 petals are pilose only with sessile hairs. The 5- or 7-foliolate leaves are 20–35 cm. long, with petioles 5–8 cm. long and oblong- to obovate-elliptic leaflet blades (7–) 12–18 \times (3–) 4–6 cm. (terminal one slightly the

largest, the lower ones the smallest). The species has been found in flower in July and November, in fruit in the same months and also in October. From its congeners in sect. *Cossignia* (i. e. the New Caledonian species, with the disk regular, falls into a different section), *C. pacifica* differs in its comparatively large leaves, petals often 6, stamens 8 or 9 (fertile ones with filaments 15–19 mm. long), and style 12–15 mm. long.

TYPIFICATION: The type is *Smith 6432* (A HOLOTYPE; many ISOTYPES), collected Nov. 3, 1947, on the southern slopes of Mt. Numbuiloa, east of Lambasa, Mathuata Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and thus far known from only four collections, all from Mathuata Province.

AVAILABLE COLLECTIONS: VANUA LEVU: MATHUATA: Vuniwambua Creek (Korovuli River tributary, 3–4 km. southeast of Nanduri), *DA 12927* (coll. *I. Qoro*, Oct. 30, 1962) (BISH, K, SUVA); mountains near Lambasa, *Greenwood 628* (K); Nasautha (locality not found), *DA 13480* (coll. *I. Qoro & I. T. Kuruvoli*, July 22, 1963) (BISH, K, SUVA).

13. *DODONAEA* Mill. Gard. Dict. Abridg. ed. 4. 1754; Seem. Fl. Vit. 48. 1865; Radlk. in Pflanz. 98 (IV. 165); 1350. 1933.

Hermaphrodite, dioecious, monoecious, or polygamous shrubs or small trees, the leaves simple (as in our species) or pinnate, with glandular-punctate and often viscid blades; inflorescences axillary or terminal, frequently paniculate, the flowers actinomorphic, ♀ or unisexual; calyx usually deeply 3–5-lobed, the lobes valvate; petals none; stamens 4–12 (lacking or present as staminodes in ♀ flowers), with short, glabrous filaments, the anthers large, apiculate; disk small or obsolete; ovary often subglobose or compressed or trigonous, 2- or 3-celled, each locule with 2 superposed ovules (rudimentary in ♂ flowers), the style filiform; fruit a compressed or trigonous capsule with 2 or 3 longitudinal, submembranaceous, veined wings, usually septifragally 2- or 3-valved, with 1 or 2 exarillate seeds in each locule.

TYPE SPECIES: *Dodonaea viscosa* (L.) Jacq. (*Ptelea viscosa* L.).

DISTRIBUTION: Radlkofer recognizes 54 species, of which 52 occur in Australia. A final estimate of the number of species awaits resolution. One widespread species is here recorded as occurring in Fiji.

USEFUL TREATMENT OF GENUS: LEENHOUTS, P. W. Notes on the extra-Australian species of *Dodonaea* (Sapindaceae). *Blumea* 28: 271–289. 1983.

1. *Dodonaea viscosa* (L.) Jacq. Enum. Syst. Pl. Carib. 19. 1760; A. Gray, Bot. U. S. Expl. Exped. 1: 260. 1854; Seem. Fl. Vit. 49. 1865, op. cit. 426. 1873; Drake, Ill. Fl. Ins. Mar. Pac. 144. 1890; Gibbs in J. Linn. Soc. Bot. 39: 143. 1909; Guillaumin in J. Arnold Arb. 12: 242. 1931; Radlk. in Pflanz. 98 (IV. 165): 1363. 1933; Christophersen in Bishop Mus. Bull. 128: 133. 1935; Yuncker in op. cit. 178: 78. 1943; Sherff in Publ. Field Mus. Nat. Hist., Bot. Ser. 23: 269. 1947; Yuncker in Bishop Mus. Bull. 220: 176. 1959; J. W. Parham, Pl. Fiji Isl. 174. 1964, ed. 2. 246. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 186. 1970; St. John & A. C. Sm. in Pacific Sci. 25: 332. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 53. 1972; Leenhouts in *Blumea* 28: 285. fig. 1, a. 1983.

Ptelea viscosa L. Sp. Pl. 118. 1753.

Dodonaea triquetra sensu Seem. in Bonplandia 9: 254. 1861, Viti, 434. 1862; non Wendl.

Dodonaea angustifolia sensu Leenhouts in *Blumea* 28: 280, saltem p. p. 1983.

In Fiji this widespread species occurs from near sea level to about 1,100 m., usually in grassland and dry thickets, but also in dry forest, on sea cliffs, in cultivated areas, and along roadsides. It is found as a shrub or small tree 0.5–8 m. high, with a dull yellow or greenish yellow calyx, anthers, and fruit, the last sometimes pink-tinged or brown. It flowers and fruits copiously at all seasons.

TYPIFICATION: Linnaeus (1753) included several earlier references. In his extended consideration of the typification, Sherff (1947) suggested that the appropriate lectotype for *Ptelea viscosa* was a Plumier reference, later delineated in Plumier, Pl. Amer. (ed. Burman) fasc. 10, pl. 247, fig. 2. 1760. However, Leenhouts (1983, p. 276) proposes as the lectotype a collection (numbered v.97) in the Sloane Herbarium. Possibly the Sloane specimen is the basis of the Plukenet illustration cited by Linnaeus.

DISTRIBUTION: Pantropical and subtropical, often very abundant. From Fiji I have examined approximately 75 collections.

LOCAL NAMES AND USES: The best-known Fijian names are *usi*, *osi*, *wase*, and *kausi*, but also recorded are *wosi*, *wa usi*, *oshi*, and *katasai*. The stems are sometimes used for walking sticks, and in the Yasawas a medicinal use for sore eyes has been noted.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Yalombi, *St. John 18005*. MAMANUTHAS: NGGALITO Island, Malolo Group, *O. & I. Degener 32238*. VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 1294*; vicinity of Nandarivatu, *Gibbs 551*. NANDRONGA & NAVOSA: Nausori Village, *DA 13334*. NAMOSI: Lower slopes of Mt. Naitarandamu, *Gillespie 3186*. RA: Yanggara, *Greenwood 270A*; Rakiraki, *Degener & Ordóñez 13703*. KANDAVU: Hills above Namalata and Ngaloa Bays, *Smith 86*. OVALAU: Vicinity of Levuka, *Gillespie 4484*. VANUA LEVU: MBUA: Koromba forest, *DA 15108*. MATHUATA: Vicinity of Lambasa, *DA 10479*; Mt. Uluimbau, south of Lambasa, *Smith 6593*. THAKAUNDRIVE: Maravu, near Salt Lake, *Degener & Ordóñez 14205*; hills west of Mbutha Bay, Natewa Peninsula, *Smith 826*. MATUKU: *Milne 126*. VANUA MBALAVU: Near Lomaloma, *Smith 1425*. LAKEMBA: Nukunuku Village, *Garnock-Jones 806*. KAMBARA: On limestone formation, *Smith 1284*. FIJI without further locality, *U. S. Expl. Exped., Seemann 72*.

The treatment of the *Dodonaea viscosa* complex by Radlkofer (1933) and Sherff (1947) was briefly but adequately reviewed by Leenhouts (1983). Sherff discussed and keyed twelve infraspecific taxa, in five of which Fijian collections were included (these taxa are not listed in the above synonymy, which they would needlessly complicate). In view of the extraordinary vagility of this worldwide tropical and subtropical species, the Pacific material seems reasonably uniform to me; I regretfully conclude that, if there is a reasonable way to divide the species into smaller taxa, neither Radlkofer nor Sherff has provided it.

In his 1983 treatment of the genus *Dodonaea* outside Australia, Leenhouts provides a scholarly review of prior opinion and a conclusion that five such species have reality. He makes a heroic attempt to distinguish *D. angustifolia* L. f. from *D. viscosa* (L.) Jacq. in the Old World, acknowledging that the demarcation between them is weakest in America. Examination of numerous specimens from the Fijian Region suggests that characters utilized by Leenhouts (such as bisexual vs. "at least partly unisexual" flowers) are inconsequential, as are the effects of "coastal" vs. "inland" habitats.

As concerns the occurrence of the two taxa in the Fijian Region, Leenhouts' citations suggest that the first is the more abundant, he having examined two specimens from the New Hebrides and eleven from Fiji, and having referred to that species the material cited as *Dodonaea viscosa* from Samoa, Tonga, and Niue by Christophersen, Yuncker, and Sykes respectively. *Dodonaea viscosa* is mentioned, in the Fijian Region, from only two specimens from Samoa and Niue.

The approximately 75 Fijian collections I have examined range in habitat from coastal to forest at 1,100 m., and a conclusion that morphological variation is totally haphazard seems inevitable. The gradient from strictly "coastal" to "inland" habitat is continuous, and it would seem apparent that any two individuals, whether with bisexual or unisexual flowers, can produce progeny which flourish in any reasonably

available habitat. On the basis of this sample from the Fijian Region, Leenhouts's conclusion that two pantropical taxa should be recognized in the *Dodonaea viscosa* complex seems difficult to defend. Other aspects of his 1983 treatment are not here considered. There is a certain incongruity between his labored attempt to divide into specific taxa *Dodonaea* (a genus with notoriously wind-disseminated seeds) and his inability to contemplate any taxonomic division of *Allophylus*, a genus with comparatively reduced dispersibility and an amplitude of localized (if superficial) morphological diversity.

14. *FILICIMUM* Thw. ex Hook. f. in Benth. & Hook. f. Gen. Pl. 1: 325. 1862; Radlk. in Pflanzenz. 98 (IV. 165): 1426. 1933.

Pteridophyllum Thw. in Hook. J. Bot. Kew Gard. Misc. 6: 65. 1854; non Sieb. & Zucc. (1843).

Monoecious trees, the leaves paripinnate, in our species 5-12-jugate, the rachis winged, the leaflet blades sinuate-margined; inflorescences axillary, paniculiform, the flowers actinomorphic, unisexual; calyx with 5 narrowly imbricate lobes; petals 5, small, esquamate; disk copiously pale-pilose; stamens 5, the filaments glabrous, the anthers sterile in ♀ flowers; ovary compressed-globose (rudimentary in ♂ flowers), 2-celled, each locule with a single pendulous ovule, the style short, curved; fruit an ellipsoid drupe, 1- or 2-celled, the pyrene thin-walled, with 1 or 2 seeds.

TYPE SPECIES: *Filicium decipiens* (Wight & Arn.) Thw. ex Hook. f. (*Rhus decipiens* Wight & Arn.). *Filicium* is a substitute name for *Pteridophyllum* Thw. and is based on the same type species.

DISTRIBUTION: The genus is composed of three African species, of which one, *Filicium decipiens*, extends to Ceylon and India and is widely cultivated elsewhere.

1. *Filicium decipiens* (Wight & Arn.) Thw. ex Hook. f. in Thw. Enum. Pl. Zeyl. 408. 1864; Radlk. in Pflanzenz. 98 (IV. 165): 1427. 1933; J. W. Parham, Pl. Fiji Isl. 168. 1964, ed. 2. 247. 1972.

Rhus decipiens Wight & Arn. Prodr. Fl. Ind. Orient. 172. 1834.

Pteridophyllum decipiens Thw. in Hook. J. Bot. Kew Gard. Misc. 6: 66. 1854, Enum. Pl. Zeyl. 59. 1858.

As in other parts of the tropics, the *fern tree* is cultivated as an ornamental or shade tree. In Fiji it is seen only near sea level, as a tree up to 12 m. high; the petals are white, the disk orange, and the fruits purplish. Flowers and fruits have been observed between August and October.

TYPIFICATION: The species is typified by *Wight 520*, collected in southern India.

DISTRIBUTION: Probably a native of southeastern Africa, the species may have been an early introduction into India and is now widely cultivated. It was probably introduced into Fiji by J. B. Thurston, being listed in his 1886 *Catalogue*.

LOCAL NAMES AND USE: *Fern tree* or *fern leaf tree*; a desirable ornamental.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Nanduruloulou, DA 5593, 15599. TAILEVU: Ndakuivisama, Namata, DA 2671. REWA: Suva, DA 7401 (L.3076); Department of Forestry, Suva, DA 13700 (L.8194). VANUA LEVU: THAKAUNDROVE: Savusavu, DA 12210.

15. *HARPULLIA* Roxb. Fl. Ind. 2: 441. 1824; Radlk. in Pflanzenz. 98 (IV. 165): 1433. 1933; S. Reynolds in Austrobaileya 1: 412. 1981; Leenhouts & Vente in Blumea 28: 1. 1982.

Dioecious (rarely monoecious?) trees, the indument composed of tufted-stellate (sessile) or simple hairs, the leaves paripinnate, with (1-) 2-8 (-9) alternate or rarely opposite leaflets per side, the rachis terete (as in our species) or with oblique wings, the leaflet blades in our species chartaceous and drying green, entire, essentially glabrous;

inflorescences axillary, rarely terminal, sometimes borne on branches, thyrsoid-paniculiform, the flowers unisexual, actinomorphic; calyx with (4 or) 5 free (or essentially so) imbricate sepals; petals (4 or) 5, membranaceous, in our species (of sect. *Otonychium*) unguiculate and with inflexed auricles; stamens 5 (in our species)–8, the filaments glabrous; disk small, annular or infrequently lobed; ovary 2(–4)-locular, each locule with 1 or 2 descending, axile ovules, the style filiform, subulate, often distally twisted and with elongate stigmatic lines; fruit capsular, 2(or 3)-lobed, the lobes inflated, loculicidally dehiscent, sparsely pilose or glabrous on both surfaces, each with 1 or 2 horizontally attached seeds (1 in our population), the aril (in our species) essentially none or limited to a minute, annular sarcostema (aril obvious in sect. *Harpullia*).

TYPE SPECIES: *Harpullia cupanioides* Roxb.

DISTRIBUTION: Southeastern China, India, and Ceylon eastward throughout Malasia to Australia, Tonga, and Samoa. Radlkofer discussed 38 species; Reynolds (1981) mentioned the genus as comprising 37 species; the number was reduced to 26 by Leenhouts and Vente (1982). The species extending farthest to the east, often known as *Harpullia mellea*, is reduced to *H. arborea* by Leenhouts and Vente, whose treatment is here followed. It is one of the two species which comprise subgen. *Otonychium* (in which Radlkofer (1934) had recognized eight species).

USEFUL TREATMENTS OF GENUS: REYNOLDS, S. T. *Harpullia*. *Austrobaileya* 1:412–419. 1981. LEENHOUTS, P. W., & M. VENTE. A taxonomic revision of *Harpullia* (Sapindaceae). *Blumea* 28: 1–51. 1982.

1. *Harpullia arborea* (Blanco) Radlk. in Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 16: 404. 1887; Guillaumin in J. Arnold Arb. 12: 242. 1931, in op. cit. 14: 56. 1933; Radlk. in Pflanzenr. 98 (IV. 165): 1456. 1934; S. Reynolds in *Austrobaileya* 1: 419. fig. 29, F. 1981; Leenhouts & Vente in *Blumea* 28: 11. fig. 1, c, c¹, 2, a. 1982.

FIGURE 150.

Ptelea arborea Blanco, Fl. Filip. 63. 1837.

Harpullia mellea Lauterb. in Bot. Jahrb. 41: 229. 1908; Rechanger in Denkschr. Akad. Wiss. Wien 85: 306. 1910; Radlk. in Pflanzenr. 98 (IV. 165): 1453. 1934; Christophersen in Bishop Mus. Bull. 128: 133. 1935; A. C. Sm. in Sargentia 1: 55. 1942; Yuncker in Bishop Mus. Bull. 220: 176. 1959; J. W. Parham, Pl. Fiji Isl. 174. 1964, ed. 2. 247. 1972.

This species, infrequent in Fiji, occurs in forest on limestone from near sea level to about 100 m., as a tree 13–18 m. high with pale yellow petals and a red fruit, the seeds being shiny and dark brown to black. Flowers and fruits have been observed only in February and March.

TIPIFICATION AND NOMENCLATURE: For *Ptelea arborea*, Leenhouts and Vente (1982) indicate a new type, *Merrill*, *Sp. Blancoanae* 339 (A NEOTYPE; ISONEOTYPES AT BM, BO, K, L, NSW, P, US, W), collected in September, 1913, at Angat, Bulacan Province, Luzon, Philippines. The type of *Harpullia mellea* is *Vaupel* 459 (B HOLOTYPE destroyed; photo at BISH; ISOTYPE at WRSL), obtained Oct. 6, 1906, between Aopo and Asau, Savai'i, Samoa. The latter species is one of several reduced to *H. arborea* by Leenhouts and Vente.

DISTRIBUTION: Ceylon, southern India, and Assam eastward to northern Queensland, Tonga, and Samoa. The species appears to be rare in Fiji, thus far known from only two islands in the southern Lau Group.

LOCAL NAME: *Vuvula*.

AVAILABLE COLLECTIONS: KAMBARA: *Smith* 1267. FULANGA: *Smith* 1153.

FIGURE 150. *Harpullia arborea*: A, distal portion of branchlet, with foliage and an infructescence, × 1/4; B, ♂ flower with 2 petals removed, × 2; C, parts of ♂ flower showing pedicel with 2 sepals and pistillode, a petal (adaxial surface), and a stamen, × 2; D, dehiscent fruit and seed, × 2; E, mature fruit, × 2. A from *Smith* 1153, B & C from *Whistler* 1669 (Upolu, Samoa), D from *Whistler* 988 (Savai'i, Samoa), E from *Smith* 1267.



A



B



C



D



E

Harpullia arborea is a variable species (Leenhouts and Vente, 1982), but its division into local taxa seems inadvisable. In the Fijian Region there seems uniformly to be a single ovule and seed per locule, whereas two ovules and seeds are more frequent farther west, this character being variable. The leaflets (FIGURE 150A) in our area are usually 4-6 and with blades slightly broader than in most western populations. Samoan specimens have large fruits and seeds (FIGURE 150D), but similar large fruits also occur in India and Thailand (Leenhouts and Vente, 1982).

ORDER CORIARIALES

No consensus of opinion as to a suitable position for the unigeneric family Coriariaceae seems to have been reached by recent phylogenists. Cronquist (1981) places it in his order Ranunculales; Hutchinson (1973) assigns it ordinal rank as a relative of the Dilleniales. Lawrence (1951), Scholz (in Melchior, 1964), and Takhtajan (1980) place the family as the sole member of a suborder Coriariineae in either Sapindales or Rutales. Thorne (1976) places it in his Rutales (suborder Rutineae), Dahlgren (1980) as one of 15 families in his order Sapindales. The family is so isolated that a separate order seems merited, as suggested by Hutchinson, but its relationships may be with the Rosidae rather than with the Ranunculidae or Dilleniidae, and with the orders Rutales and Sapindales (if these are maintained as separate). Skog (1972, cited below) suggests that the relationships of *Coriaria* might better be sought near the Rosaceae rather than with the rutalean group of families.

FAMILY 141. CORIARIACEAE

CORIARIACEAE DC. Prodr. 1: 739, as *Coriariaeae*. 1824.

Shrubs (or suffrutescent perennial herbs or small trees), the branchlets quadrangular, at length terete, the stipules minute and caducous or seemingly none; leaves opposite, rarely whorled, short-petiolate or sessile, simple, the blades lanceolate to ovate, palmately nerved, entire; inflorescences racemose, axillary or terminal, bracteate, the flowers ♀ and proterogynous (as in our species) or sometimes unisexual, small, actinomorphic, the pedicels bracteolate or not; sepals 5, imbricate, ovate-deltoid, persistent; petals 5, valvate, shorter than sepals at anthesis, carinate within, thickening after anthesis and intruded between carpels, at length accrescent; stamens 10, bicyclic, hypogynous, free (or 5 adnate to petal keels), the filaments elongating after ♀ anthesis (in ♂ flowers), the anthers large, becoming exerted at anthesis, oblong, dehiscing by longitudinal slits; carpels 5-10 (-12), free or essentially so, adnate to conical receptacle, 1-locular, the ovules solitary, pendulous from apex, anatropous, apotropous (with a dorsal raphe), the styles free, elongated, uniformly stigmatose, caducous before ♂ anthesis (in ♂ flowers); fruit composed of separate, laterally compressed, dorsally carinate achenes, these closely subtended by accrescent petals, the seed compressed, the endosperm scanty or none, the embryo large, straight.

DISTRIBUTION: A unigeneric family discontinuously distributed in warm temperate and upland tropical areas in Eurasia and America; absent from Australia and from Africa south of the Sahara; in the Pacific occurring in New Zealand and from New Guinea eastward to Samoa and the Society Islands.

USEFUL TREATMENTS OF FAMILY: HUTCHINSON, J. *Coriariaceae*. Gen. Fl. Pl. 1: 172-173. 1964. SKOG, L. E. The genus *Coriaria* (Coriariaceae) in the Western Hemisphere. *Rhodora* 74: 242-253. 1972.

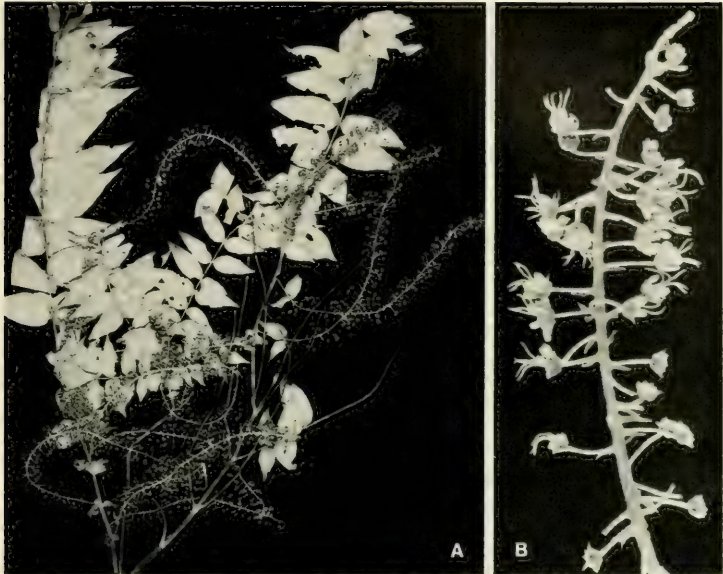


FIGURE 151. *Coriaria rusCIFolia*, from Smith 907: A, distal portions of branchlets, with inflorescences, $\times 1/3$; B, terminal portion of a flowering raceme, $\times 2$.

1. CORIARIA L. Sp. Pl. 1037. 1753; Hutchinson, Gen. Fl. Pl. 1: 173. 1964; van Balgooy in Blumea Suppl. 5: 122. 1966; Skog in Rhodora 74: 242. 1972; Conn in Henty, Handb. Fl. Papua New Guinea 2: 31. 1981.

Characters and distribution of the family.

LECTOTYPE SPECIES: *Coriaria myrtifolia* L. (vide M. L. Green, Prop. Brit. Bot. 192. 1929), one of the two original species.

DISTRIBUTION: The number of species assigned to *Coriaria* reflects uncertainty as to specific delimitation, ranging from five (Skog, 1972; Cronquist, 1981) to about 15 or up to 30 (Conn, 1981). Presumably only one species occurs in Pacific areas.

1. *Coriaria rusCIFolia* L. Sp. Pl. 1037. 1753; Horne, A Year in Fiji, 259. 1881; Turrill in J. Linn. Soc. Bot. 43: 19. 1915; Christophersen in Bishop Mus. Bull. 128: 126. 1935; J. W. Parham, Pl. Fiji Isl. 60. 1964, ed. 2. 93. 1972; Skog in Rhodora 74: 246. 1972.

FIGURES 151, 152.

As seen in Fiji, *Coriaria rusCIFolia* is found at elevations of 550–1,241 m. in the dense thickets of crests and ridges, in hillside thickets, in the forest-grassland transition, and on rocky banks, as a shrub 1–3 m. high. The subsessile leaves have ovate or ovate-lanceolate blades (2–) 3–6 \times (0.8–) 1.5–3 cm., rounded to cordate and sometimes amplexicaul at base, long-acute at apex, 5- or 7-nerved from base. The racemes are either axillary or terminal on lateral branchlets, (5–) 10–30 cm. long, with closely pilose

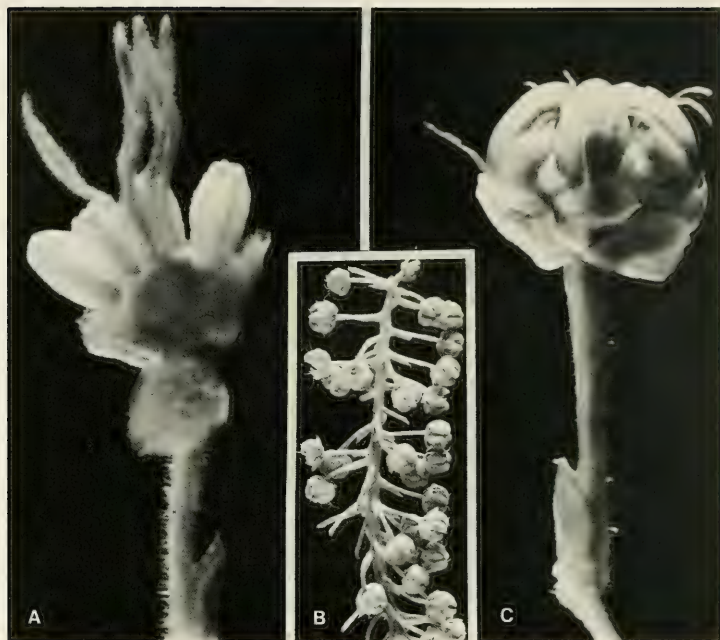


FIGURE 152. *Coriaria ruscifolia*; A, flower at ♀ anthesis, the styles receptive, the anthers undeheisced, × 14; B, terminal portion of a fruiting raceme, × 2; C, developing fruit, the achenes nearly mature, the filaments elongated and without anthers, the petals intruded between achenes, × 14. A from Smith 907, B & C from Smith 6021.

rachises and pedicels. The sepals and petals are green or reddish, the filaments white, the anthers reddish, becoming yellow and pink-tinged, the styles pale green, pinkish distally, and the achenes purple, drying with 3 or 5 prominent dorsal keels. Flowers and essentially mature fruits have been obtained between October and May.

TYPEIFICATION: The sole basis of *Coriaria ruscifolia* is Feuillée, J. Obs. 3: 17. t. 12. 1725.

DISTRIBUTION: Western Hemisphere and, in the Eastern Hemisphere, from New Guinea eastward, reported from the Solomons, New Hebrides, Fiji, Samoa, the Societies, New Zealand, and the Kermadec and Chatham Islands. Skog (1972) considers this the only species to occur in America, with subsp. *ruscifolia* in Chile and western Argentina and subsp. *microphylla* (Poir.) Skog from Mexico to Peru. He indicates the latter subspecies to occur in New Guinea and New Zealand, ascribing both subspecies to New Zealand. Conn (1981) maintains the Papuasian population as *Coriaria papuana* Warb., remarking that "This species is hardly distinct from the closely related *C. ruscifolia* L., which is widespread throughout the Pacific."

In Fiji *Coriaria ruscifolia* subsp. *ruscifolia* has been collected only on Viti Levu and Taveuni; it is locally frequent on the northern escarpment of Viti Levu and may be anticipated in other suitable localities above 550 m.

LOCAL NAMES: Names recorded from Mba Province, but only once each, are *wasalele* and *mariko ni tambale*.

AVAILABLE COLLECTIONS: VITI LEVU: Mba: Mt. Evans Range, *Greenwood 123*; northern portion of Mt. Evans Range, between Mt. Vatuyanitu and Mt. Natondra, *Smith 4342*; Mt. Mbotilamu, Mt. Evans Range, *DA 14811*; slopes of escarpment north of Nandarivatu, *Gillespie 4192*, *Smith 6021*; vicinity of Nandarivatu (doubtless some from escarpment slopes), in *Thurn 68*, *Tothill* (coll. *W. Teulon*) *581*, *592*, *DA 7068*, *7069*, *13099*; summit of Mt. Nanggaranambuluta, east of Nandarivatu, *Gillespie 3937*. NAMOSI: Summit of Mt. Voma, *Horne 769*. TAVEUNI: Summit of Mt. Uluingalau, *Smith 907*.

ORDER GERANIALES

KEY TO FAMILIES OCCURRING IN FIJI

- Flowers actinomorphic, not spurred; stamens usually 10 (rarely more numerous, 5 sometimes staminodial); ovary (in our genera) with distinct, persistent styles; fruit a loculicidal capsule or a berry; herbs, shrubs, or small trees; leaves palmately or pinnately compound or trifoliolate (rarely unifoliolate), the petioles articulated. 142. OXALIDACEAE
- Flowers zygomorphic, the sepals petaloid, the posterior one usually the largest, somewhat saccate, and with a nectariferous spur; stamens 5; ovary with the style short or obsolete; fruit (in our genus) a 5-valved, loculicidal, elastically dehiscent capsule; annual or perennial herbs; leaves simple. 143. BALSAMINACEAE

FAMILY 142. OXALIDACEAE

OXALIDACEAE R. Br. in Tuckey, Narr. Exped. Congo, 433, as *Oxalideae*. 1818.

Herbs (sometimes with tubers or bulbs), shrubs, or small trees, the stipules small or lacking; leaves alternate or subopposite, sometimes all basal, palmately or pinnately compound or trifoliolate or unifoliolate, the petioles articulated; inflorescences axillary, pseudoterminal, or basal, cymose or umbelliform or paniculiform or sometimes reduced to a single flower, bracteate, the flowers ♂, actinomorphic, 5-merous, usually heterostylous, the pedicels articulate; sepals 5, imbricate, persistent; petals 5, contorted or imbricate, free or proximally cohesive; stamens usually 10 (rarely more numerous, 5 sometimes staminodial), hypogynous, bicyclic, obdiplostemonous, the filaments connate proximally, the anthers dorsifixed, versatile, 2-locular, dehiscing by longitudinal slits; disk lacking, but nectary glands sometimes borne at base of epipetalous (shorter) filaments; gynoecium composed of (3-) 5 carpels united into a plurilocular ovary, the placentae axile, the ovules (1 or) 2-several per locule, pendulous, anatropous or hemitropous, epitropous, the styles (in our genera) distinct, persistent, the stigmas capitate or punctate; fruit a loculicidal capsule or a berry, the seeds usually with a basal aril, the embryo large, straight, the endosperm copious.

DISTRIBUTION: Pantropical and subtropical, extending into temperate areas, with seven or eight genera and 850-1,000 species. Two genera are found in Fiji, and a single species is probably indigenous.

USEFUL TREATMENTS OF FAMILY: KNUTH, R. *Oxalidaceae*. *Pflanzenr.* 95 (IV. 130): 1-481. 1930. KNUTH, R. *Oxalidaceae*. *Engl. & Prantl, Nat. Pflanzenfam.* ed. 2. 19a: 11-42. 1931. VELDKAMP, J. F. *Oxalidaceae*. *Fl. Males.* 1. 7: 151-178. 1971.

KEY TO GENERA

- Herbaceous plants (our species), sometimes with bulbs, the leaves digitately or pinnately 3-foliolate; fruit capsular, loculicidally dehiscent, small. 1. *Oxalis*
- Woody plants, the leaves imparipinnate (leaflets 7-41); fruit fleshy, indehiscent, large, edible. 2. *Averrhoa*

1. *Oxalis* L. Sp. Pl. 433. 1753; Seem. Fl. Vit. 30. 1865; Knuth in Pflanzenr. 95 (IV. 130): 43. 1930, in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19a: 25. 1931; Veldkamp in Fl. Males. I. 7: 153. 1971.

Annual or perennial herbs (rarely shrubby), sometimes with rhizomes or bulbs, with stipules adnate to petiole bases or lacking; leaves digitately or pinnately foliolate, the leaflets usually 3; inflorescences solitary, axillary or arising from bulbs, the pedicels articulate at base and sometimes at apex; sepals shortly connate basally; petals contorted, clawed, cohesive above claws; stamens with filaments of 2 lengths, the longer filaments sometimes dorsally toothed; ovary locules with 1-10 ovules, these 1- or 2-seriate; fruit capsular, loculicidally dehiscent, the seeds smooth or transversely ridged or longitudinally sulcate, ejected by basal arils.

LECTOTYPE SPECIES: *Oxalis acetosella* L. (vide Small in N. Amer. Fl. 25: 25. 1907), one of the original 13 species.

DISTRIBUTION: Cosmopolitan, probably with 700 or more species, some adventive or introduced and naturalizing in the Pacific. Four species are here recorded from Fiji, one of them (*Oxalis novae-guineensis*) presumably indigenous. If this record is correct, the indigenous occurrence of *Oxalis* in the Pacific area is extended eastward to Fiji; it had previously (in sect. *Corniculatae*) been considered to terminate in New Guinea, New Britain, New Caledonia, and the Kermadec Islands (Lourteig, 1979).

USEFUL TREATMENTS OF GENUS: EITEN, G. Taxonomy and regional variation of *Oxalis* section *Corniculatae*. I. Introduction, keys and synopsis of the species. Amer. Midl. Nat. 69: 257-309. 1963. LOURTEIG, A. Oxalidaceae extra-Austroamericanae I. *Oxalis* L. sectio *Thamnoxyis* Planchon. Phytologia 29: 449-471. 1975. LOURTEIG, A. Oxalidaceae extra-Austroamericanae II. *Oxalis* L. sectio *Corniculatae* DC. Phytologia 42: 57-198. 1979.

KEY TO SPECIES

- Leaves borne along a distinct, supraterranean, creeping to erect stem; petioles seldom exceeding 6 cm. in length.
- Leaves pinnately 3-foliolate, the petiole continued into a rachis below terminal leaflet, the leaflet blades obtuse or rounded at apex; petals pink except toward base; infrequent weed (sect. *Thamnoxyis*).
1. *O. barrelieri*
- Leaves digitately 3-foliolate, the leaflet blades obcordate; petals yellow (sect. *Corniculatae*).
Stems rarely more than 50 cm. long, usually rooting at nodes; indument of esepate hairs; weedy plant, an early introduction. 2. *O. corniculata*
- Stems up to 100 cm. long, suberect; indument of pedicels composed of septate hairs mixed with esepate ones; presumably indigenous. 3. *O. novae-guineensis*
- Leaves all basal; stemless herb from bulbous base; petioles to 30 cm. long, the leaflet blades obcordate; petals pink or purplish except toward base; cultivated and also a naturalized weed (sect. *Ionoxalis*).
4. *O. corymbosa*

1. *Oxalis barrelieri* L. Sp. Pl. ed. 2. 624. 1763; Knuth in Pflanzenr. 95 (IV. 130): 65. 1930; Veldkamp in Fl. Males. I. 7: 155. fig. 1, f, g. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 11. 1972; Lourteig in Phytologia 29: 456. fig. 2, A. 1975.

Oxalis bahiensis sensu Glassman in Bishop Mus. Bull. 209: 57. 1952; J. W. Parham, Pl. Fiji Isl. ed. 2. 345. 1972; non Progel.

An infrequent weed of roadsides and cultivated areas, seen as an erect herb 20-150 cm. high; indument composed of whitish, esepate hairs, sometimes sparse but apparent on stems, petioles, and lower surfaces of leaflet blades; leaves pinnately 3-foliolate, the petiole 1.5-3.5 cm. long, continued into a rachis 5-10 mm. long below terminal leaflet, the leaflet blades elliptic to oblong, up to 3.5 × 2.5 cm. (terminal one the largest), obtuse or rounded at apex; petals (to 9 × 3.5 mm.) pink except toward the greenish or yellowish base; capsules ovoid, 5-10 × 2-5 mm., 5-angled, with 2-4 seeds per locule. The only specimen at hand was flowering in June.

TYPIFICATION: The species (Lourteig, 1975) is based on Barrelier, Plant. Rar. 64. pl. 1139. 1714.

DISTRIBUTION: Indigenous in the West Indies and Central and South America, *Oxalis barrelieri* has been introduced into parts of Africa, Ceylon, and Malasia; it has been noted as an occasional weed in the Caroline and Mariana Islands and Samoa but is known from only a single collection in Fiji.

AVAILABLE COLLECTION: FIJI without further locality (but according to J. W. Parham, 1972, probably from Suva), *DA L.11758* (coll. C. R. Vasey, June 15, 1966).

2. *Oxalis corniculata* L. Sp. Pl. 435. 1753; Seem. in *Bonplandia* 9: 255. 1861, Viti, 434. 1862, Fl. Vit. 30. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 129. 1890; Knuth in *Pflanzenr.* 95 (IV. 130): 146. 1930; Greenwood in *Proc. Linn. Soc.* 154: 95. 1943; Yuncker in *Bishop Mus. Bull.* 220: 151. 1959; J. W. Parham in *Dept. Agr. Fiji Bull.* 35: 50. 1959; Eiten in *Amer. Midl. Nat.* 69: 299. 1963; J. W. Parham, *Pl. Fiji Isl.* 253. 1964, ed. 2. 345. 1972; Veldkamp in *Fl. Males. I.* 7: 155. 1971.

Oxalis repens Thunb. *Diss. Oxal.* 16. t. 1. 1781.

Oxalis corniculata var. *repens* Zucc. in *Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss.* 1: 230. 1831 (?); Knuth in *Pflanzenr.* 95 (IV. 130): 150. 1930; Christophersen in *Bishop Mus. Bull.* 128: 105. 1935; Yuncker in *op. cit.* 178: 66. 1943, in *op. cit.* 184: 43. 1945; Sykes in *New Zealand Dept. Sci. Indust. Res. Bull.* 200: 143. 1970; B. E. V. Parham in *New Zealand Dept. Sci. Indust. Res. Inform. Ser.* 85: 11, 44. 1972.

Oxalis corniculata var. *corniculata*; Knuth in *Pflanzenr.* 95 (IV. 130): 147. 1930; Sykes in *New Zealand Dept. Sci. Indust. Res. Bull.* 200: 143. 1970.

Oxalis corniculata subsp. *corniculata*; Lourt. in *Phytologia* 42: 98. fig. 5. 1979.

As seen in Fiji, *Oxalis corniculata* occurs at elevations from near sea level to about 750 m. as a common weedy plant along roads and trails, in moist places, pastures, waste places, plantations, and in villages. It is a caespitose or creeping herb, with stems rarely exceeding 50 cm. in length, usually rooting at nodes and ascending toward apices, variably pilose on stems, petioles, and leaflet blades; stipules usually present but inconspicuous, to 3 mm. long; indument composed of esepate hairs (sometimes hairs of capsules septate); petioles 1–6 cm. long, the leaflets subsessile and subequal, the blades obovate, 4–20 mm. long and broad, incised 1–2 their length, the sinus acute to obtuse, the lobes usually rounded; inflorescences 1–6-flowered, usually 2–7 cm. long, the bracts and bracteoles deltoid-linear, 0.5–3 mm. long, the pedicels 4–15 mm. long, with esepate hairs; sepals lanceolate to narrowly ovate, 2.5–6 mm. long; petals yellow, oblong-subspathulate, somewhat larger than sepals; capsules subcylindric, acute, 5–20 × 2–4 mm., sometimes with septate hairs, with 5–10 seeds per locule. Flowers and fruits are seen throughout the year.

TIPIFICATION: *Oxalis corniculata* is typified by no. 11084 in Thunberg's herbarium (UPS LECTOTYPE), from a plant grown in the Uppsala Botanic Garden; *O. repens* by no. 11118 in Thunberg's herbarium (UPS HOLOTYPE), from Africa (Lourteig, 1979, pp. 60, 99).

DISTRIBUTION: Cosmopolitan, the area of origin uncertain, suggested as Indo-Malesian and Australasian by Eiten (1963) and as Mediterranean-European by Lourteig (1979). Presumably it is not indigenous in Fiji but was an early introduction, doubtless inadvertent, and was widely established by 1860 (Seemann, 1865). About 30 collections from Fiji have been examined.

LOCAL NAMES: In addition to the usual name *totowiwi*, the names *rongomi* and *matakoni* have been recorded.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Nalotawa, eastern base of Mt. Evans Range, *Smith 4326*; vicinity of Nandarivatu, *Gillespie 4161.1*. NANDRONGA & NAVOSA: Agricultural Station, *Nathotholevu, DA 10831*. NAMOS: Wainimakutu, valley of Wainavindrau Creek, *Smith 8813*. RA: Hills near Penang, *Greenwood 764*. NAITASIRE: Plant Introduction and Quarantine Station, *Nanduruloulou, DA 9577*; vicinity of Nasinu, *DA 11106*; Koronivia, *DA 7545*. TAILEVU: Ndakuivuna, east of Wainimbuka River, *Smith 7087*. REWA: Suva, *DA 7416*. NAIRAI: *Milne 160*. NGAU: *Milne 209*. VANUA LEVU: MATHUATA: Natua, Seangangga Plateau, *Smith 6663*. TAVEUNI: Vuna, *DA 5741*. LAKEMBA: Near Tumbou, *Garnock-Jones 898*. MOTHE: *Bryan 477*. FIJI without further locality, *Seemann 89*.

Lourteig (1979, pp. 98-144) considers *Oxalis corniculata* to comprise three subspecies, of which only subsp. *corniculata* extends to the Old World; in this she recognizes three varieties (although var. *corniculata* is not named as such), all of which are found in the Fijian Region. If this division is retained, the three varieties of *O. corniculata* subsp. *corniculata* may be distinguished as follows:

Plants comparatively large, with prostrate or repent stems up to 50 cm. long; stems, stipules, and leaves green; capsule retrorse-pubescent.

Leaflet blades glabrous or sometimes sparsely pubescent on both surfaces, the upper surface more sparsely pilose than the lower. a. var. *corniculata*

Leaflet blades copiously pilose on both surfaces. b. var. *villosa*

Plants smaller, less inclined to sprawl; stems, stipules, and leaves purplish; capsule slightly pubescent to glabrous. c. var. *atropurpurea*

The nomenclature, typification, and distribution of these three varieties are detailed by Lourteig (1979). In many discussions *Oxalis corniculata* seems to be used in an inclusive sense, although some floristic botanists separate *O. repens* Thunb. at some level; the latter taxon is submerged in var. *corniculata* in Lourteig's treatment.

Oxalis corniculata subsp. *corniculata* var. *villosa* (M. Bieb.) Hohen. is represented in Fiji by *Smith 4326* and *Gillespie 4161.1* among the specimens cited above. Most collections here listed (although I have not reexamined all of them in connection with the present review) are probably referable to *O. corniculata* subsp. *corniculata* var. *corniculata* (sensu Lourteig). However, var. *atropurpurea* Planch. has also been noted in Fiji; the specimens indicated by collectors as having "leaves purplish" doubtless represent that variety, which is also known from Samoa and Niue. Sykes (1970, cited above) considers it a cultivar of *O. corniculata* var. *repens*.

3. *Oxalis novae-guineensis* Lourt. in *Phytologia* 42: 171. fig. 12, B. 1979.

Oxalis corniculata var. *papuana* Knuth in *Repert. Sp. Nov.* 48: 3. 1940; non *Oxalis papuana* F. v. Muell.

As represented by the single Fijian collection at hand, *Oxalis novae-guineensis* is a suberect herb in the long grass of crest thickets at an elevation of about 1,000 m.; stems as long as 1 m., arising singly from a thin underground rhizome; stipules absent, the petioles dilated at base; indument composed of lax, mostly esepate hairs (mixed with a few septate hairs on younger parts, but septate ones conspicuously present on pedicels); petioles 2-5 cm. long, the leaflets subsessile and subequal (but lateral ones slightly asymmetric), the blades obovate, 8-20 mm. long and broad, sharply incised to about 1/3 their length, the lobes rounded, the indument sparser above than beneath; inflorescences laxly 2-several-flowered, to 12 cm. long, the bracts and bracteoles lanceolate, 2-5 mm. long, the pedicels to 20 mm. long, with conspicuously septate hairs mixed with esepate ones; sepals and petals linear-oblong, 5-6 mm. long, the petals yellow.

TYPIFICATION: The type of *Oxalis corniculata* var. *papuana* (and thus of *O. novae-guineensis*) is *Clemens 6335* (B HOLOTYPE presumably destroyed; LECTOTYPE at A), collected in May, 1937, at Mt. Sarawaket, Morobe District, Papua New Guinea.

DISTRIBUTION: New Guinea, Australia, and Lombok (according to Lourteig), the range here extended to Fiji.

AVAILABLE COLLECTION: VITI LEVU: MBA: Slopes of Mt. Nairoso, at base of ultimate pinnacle, eastern flank of Mt. Evans Range, *Smith 4406* (A, BISH, BRI, K, US, etc.) (coll. May 14, 1947, in flower).

I am indebted to B. E. V. Parham for suggesting (in litt., 1972) that *Smith 4406* cannot be referred to *Oxalis corniculata* (as which duplicates were distributed) but clearly represents subject. *Strictae* as that is distinguished from subject. *Corniculatae* by Eiten (1963, p. 263). Parham indicated my collection to be identical with specimens from the highlands of New Guinea at BRI. As understood by Eiten, his subject. *Strictae*

is represented in the Old World only by *O. stricta* L., which (1963, p. 304) he believed to occur only as far south as northern China and Japan. Lourteig (1979) does not separate the two subsections and rejects Eiten's interpretation of *O. stricta*, substituting for his specific concept the name *O. fontana* Bunge. Plants of this apparent relationship in New Guinea, Australia, and adjacent areas seem to be those discussed by Lourteig as *O. novae-guineensis* and *O. chnoodes* Lourt. I believe the Fijian specimen to represent an eastward extension of the range of the first of these. *Oxalis corniculata* var. *papuana* Knuth (the nomenclatural basis of *O. novae-guineensis*) was included by Veldkamp (1971, p. 155) in his concept of *O. corniculata*. While there appear to be hybrids between *O. corniculata* and *O. novae-guineensis* (Lourteig, 1979, p. 192), the two taxa seem adequately to merit separation.

4. *Oxalis corymbosa* DC. Prodr. 1: 696. 1824; A. C. Sm. in Sargentia 1: 40. 1942; J. W. Parham in Dept. Agr. Fiji Bull. 35: 50. 1959, Pl. Fiji Isl. 253. 1964, ed. 2. 345. 1972; Veldkamp in Fl. Males. I. 7: 159. fig. 1, e. 1971.

Oxalis martiana Zucc. in Denkschr. Königl. Akad. Wiss. München 9: 144. 1825; Knuth in Pflanzenr. 95 (IV. 130): 250. 1930; Greenwood in Proc. Linn. Soc. 154: 95. 1943.

Perennial, stemless herb from bulbous base, without a rhizome, occasionally cultivated and frequently naturalized in gardens, waste places, and along trails near sea level, with an obvious indument of pale brown, lax, sometimes twisted hairs; leaves all basal, with petioles up to 30 cm. long, digitately 3-foliolate, the leaflets subsessile, subequal, the blades obcordate, minutely punctate, usually 1.5–4 × 2–5 cm.; inflorescences borne on peduncles longer than leaves; petals pink or purplish, yellowish at base, up to 15 × 6 mm. Flowers have been observed in months scattered throughout the year, but fruits do not seem to develop in the garden escape.

TYPIIFICATION: *Oxalis corymbosa* was based on plants from La Réunion and Mauritius; *O. martiana* on collections apparently made by Martius and Beyrich near Rio de Janeiro, Brazil. Of the two binomials that have been widely used for this species, de Candolle's was published in January, 1824. A reprint of Zuccarini's monograph was issued in January, 1825, and Stafleu (Tax. Lit. 512. 1967) suggests that the date of the original *Denkschriften* text was also 1825 (not 1823 or 1824 as sometimes cited).

DISTRIBUTION: Indigenous in tropical South America but now cultivated and often naturalized in many other tropical areas. In the Pacific it has been recorded from New Caledonia, Samoa, the Societies, and Hawaii as well as Fiji, where it is an occasional garden ornamental, now escaped and becoming a weed of waste places and cultivated land, difficult to eradicate. It was first noted in Suva by Greenwood in the 1920's or 1930's (Smith, 1942; Parham, 1959).

AVAILABLE COLLECTIONS: VITI LEVU: Mba: Lautoka, *Greenwood 803*; also mentioned by Greenwood (1943) from Rarawai Mill, near the town of Mba, but no specimen noted. NAITASIRE: Mbatiki, Nandurulou, *DA 5605, 11742*. REWA: Suva, *DA 11229, 11540, 13275*.

2. *AVERRHOA* L. Sp. Pl. 428. 1753; Knuth in Pflanzenr. 95 (IV. 130): 417. 1930; Veldkamp in Fl. Males. I. 7: 174. 1971.

Shrubs or trees, stipulate; leaves alternate or terminally clustered, imparipinnate, the leaflets subopposite, subsessile, with entire blades; inflorescences axillary or borne on branches or trunks, loosely cymose, the bracts small, caducous, the flowers heterostylous; sepals shortly connate basally; petals contorted, clawed, free or cohesive above claw; stamens all fertile or the shorter ones lacking anthers, the filaments shortly connate at base; ovary appressed-pilose, the locules with 3–7 ovules, the styles free, the stigmas capitate; fruit fleshy, indehiscent, faintly or acutely angled, the seeds flattened, arillate or not.

LECTOTYPE SPECIES: *Averrhoa bilimbi* L. (vide Small in N. Amer. Fl. 25: 57. 1907), one of the three species included by Linnaeus.

DISTRIBUTION: A genus of two species probably indigenous in Malesia, now cultivated throughout the tropics and sometimes naturalized. Both species have many uses (cf. Burkill, Dict. Econ. Prod. Malay Penins. ed. 2. 271–274. 1966).

KEY TO SPECIES

Leaves 3–6-jugate; inflorescences axillary, rarely borne on branchlets; petals to 8 mm. long, minutely puberulent within, cohesive above claw; shorter stamens without anthers; ovules 3–5 per locule; fruit sharply angled, stellate in cross section, the seeds arillate. 1. *A. carambola*
 Leaves 7–20-jugate; inflorescences borne on trunk or branches, rarely axillary; petals 10–20 mm. long, glabrous within, not cohesive; all stamens with anthers; ovules 4–7 per locule; fruit terete or obtusely angled, the seeds exarillate. 2. *A. bilimbi*

1. *Averrhoa carambola* L. Sp. Pl. 428. 1753; Knuth in Pflanzenr. 95 (IV. 130): 417. 1930; Christophersen in Bishop Mus. Bull. 128: 105. 1935; Yuncker in op. cit. 220: 151. 1959; J. W. Parham, Pl. Fiji Isl. 168. 1964, ed. 2. 239. 1972; Purseglove, Trop. Crops, Dicot. 638. fig. 98. 1968; Veldkamp in Fl. Males. I. 7: 175. fig. 9. 1971; Hutchinson, Fam. Fl. Pl. ed. 3. 442. fig. 212. 1973.

As cultivated near sea level in Fiji, *Averrhoa carambola* is a tree 3–10 m. high (to 14 m. elsewhere), with bright red sepals drying yellowish brown. The inflorescences are usually borne with the leaves, which have 7–13 leaflets with predominantly elliptic-ovate blades usually 3–8 × 1.5–3 cm., acute at apex, the distal ones the largest. The fruits turn from green to translucent yellow when ripe and are then ovoid to ellipsoid, up to 12.5 × 6 cm., acutely 5-angled, and stellate in cross section, with seeds about 15 × 5 mm. enclosed by a fleshy aril. Flowers were noted in February and March.

TYPIIFICATION: Of the several references listed by Linnaeus, the suitable LECTOTYPE is probably furnished by Hermann's Ceylon material.

DISTRIBUTION: Possibly indigenous in central and eastern Java (Veldkamp, 1971), now widespread in Malesia and elsewhere.

LOCAL NAMES AND USES: Names used in Fiji are *carambola* and *wi ni India*. The fruits are sweet or acid in different forms and are used in salads and for making preserves, tarts, and drinks. Other uses are noted by Burkill (1966) and Veldkamp (1971). Probably first introduced into Fiji by J. B. Thurston, being listed in his 1886 *Catalogue*.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Nasinu, DA 11236; Nasinu Experiment Station, DA 1565; Principal Agricultural Station, Koronivia, DA 12356; Fiji School of Agriculture, Koronivia, DA 16736. REWA: Suva, Kimberley Park, DA 3119 (L.2923).

2. *Averrhoa bilimbi* L. Sp. Pl. 428. 1753; Knuth in Pflanzenr. 95 (IV. 130): 418. fig. 26. 1930; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 100. 1948, in op. cit. 29: 31. 1959, Pl. Fiji Isl. 168. 1964, ed. 2. 239. 1972; Purseglove, Trop. Crops, Dicot. 638. 1968; Veldkamp in Fl. Males. I. 7: 177. 1971.

As sparingly cultivated near sea level in Fiji, *Averrhoa bilimbi* is a shrub or small tree 4–10 m. high (to 15 m. elsewhere), with yellowish red to purple sepals and red petals. It is usually cauliflorous and ramiflorous, the leaves having 15–41 leaflets with predominantly oblong blades usually 3–7 × 1.5–2.5 cm., acute at apex, a few proximal ones smaller than the distal ones. The fruits are green, terete to obtusely angled, ellipsoid to obovoid, up to 10 × 5 cm., with seeds 6–8 × 4–6 mm. and lacking arils. Flowers have been recorded in February, July, and September, fruits in February.

TYPIFICATION: As for the preceding species, the suitable **LECTOTYPE** may be furnished by Hermann material from Ceylon.

DISTRIBUTION: Country of origin unknown, but often seen as a relict of former cultivation in eastern Malesia (Veldkamp, 1971) and now widespread.

LOCAL NAMES AND USES: Known as *bilimbi*, *cucumber tree*, or *tree cucumber*, this species has an acid fruit not as popular as that of *Averrhoa carambola*, but it may also be used in making pickles, curries, and preserves. Although *DA 16299* was obtained from J. B. Thurston's garden, he did not list the species in his 1886 *Catalogue* and it may be a more recent introduction.

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Suva Botanical Gardens, *DA 12099*; Suva, in private garden, *DA 16299*.

FAMILY 143. BALSAMINACEAE

BALSAMINACEAE A. Rich. in Bory, Dict. Class. Hist. Nat. 2: 173, as *Balsamineae*. 1822.

Usually annual or perennial herbs, estipulate (or with minute petiolar glands), often with carnosé stems; leaves simple, usually alternate, less often opposite or verticillate, the blades pinnate-nerved; inflorescences axillary, the flowers solitary or in umbelliform cymes, ♂, zygomorphic, protandrous, resupinate; sepals 3 or 5, imbricate, petaloid, the posterior one usually the largest and somewhat saccate and with a nectariferous spur, the lateral ones free or connate; petals 5, free or the lateral ones connate in pairs; disk lacking; stamens 5, alternate with petals, hypogynous, the filaments short, free or more or less connate, sometimes with scalelike appendages within, these partly united over gynoeceium, the anthers 2-locular, introrse, connivent, dehiscing by a slit or pore; gynoeceium composed of (4 or) 5 carpels united into a syncarpous ovary, the placentation axile, the ovules (1-) 2-many per locule, anatropous, pendulous, apotropous (with dorsal raphe), the style short or obsolete, the stigmas 5, minute (or 1); fruit capsular, usually loculicidally and elastically dehiscent, rarely baccate, the seeds without endosperm, the embryo straight.

DISTRIBUTION: Eurasia, Africa, and North America, lacking in South America and Australia, with three genera and 450-800 species. Wood (1975) considers two of the genera monotypic, the remaining species belonging in *Impatiens*, which is sometimes cultivated in Fiji.

USEFUL TREATMENTS OF FAMILY: WOOD, C. E., JR. The Balsaminaceae in the southeastern United States. *J. Arnold Arb.* 56: 413-425. 1975. GREY-WILSON, C. Balsaminacées. *Fl. Masc. Fam.* 64. 1-5. 1979. Both species cultivated in Fiji are among the three treated by Grey-Wilson from the Mascarenes.

1. *IMPATIENS* L. Sp. Pl. 937. 1753; C. Wood in *J. Arnold Arb.* 56: 416. 1975; Grey-Wilson in *Fl. Masc. Fam.* 64. 1. 1979.

Characters of the family; leaf blades usually incised at margin, the crenatures often mucronate; flowers solitary or in clusters of 2 or 3; lateral petals connate in pairs, the pairs free; ovary 5-locular, the ovules 3-many, 1-seriate, the stigmas 5 or 1 (5-lobed); fruit a 5-valved capsule with explosive dehiscence, the valves fleshy, elastic.

LECTOTYPE SPECIES: *Impatiens noli-tangere* L. (vide Rydberg in *N. Amer. Fl.* 25: 93. 1910), one of the seven original species.

DISTRIBUTION: As of the family and including all its species except two. Two species are known to be cultivated in Fiji.

KEY TO SPECIES

- Leaves petiolate, the petiole 1.3–6 cm. long, with glandular projections 1–2 mm. long, the blades elliptic to ovate, 3.5–13 × 2.5–7.5 cm., crenulate-denticulate at margin, the teeth about 2 per centimeter, each with a glandular projection 1–2 mm. long; flowers 1–3 (if solitary, with the pedicel bracteate at middle), the peduncle to 2.5 cm. long, the bracts linear-elliptic to subulate, 3–6 mm. long; lateral sepals 3–7 mm. long; inferior sepal narrowed into a spur 30–50 mm. long, glabrous; dorsal petal broadly obovate, slightly concave, 11–19 × 13–25 mm.; upper and lower lateral petals in each pair similar; ovary and capsule glabrous. 1. *I. wallerana*
- Leaves sessile or short-petiolate, the petiole (and decurrent base of leaf blade) with rounded glandular projections, the blades narrowly elliptic or lanceolate to obovate, 6–12 × 1.2–3 cm., acutely serrulate-dentate at margin, the teeth 3 or 4 per centimeter; flowers 1–3 in sessile fascicles (if solitary, with the pedicel bracteate at base), the bracts ovate, inconspicuous, 1–2 mm. long; lateral sepals 2–2.5 mm. long; inferior sepal narrowed into a spur 15–21 mm. long, finely pubescent; dorsal petal cuculliform, 9–10 × 5–6 mm.; upper lateral petals clearly smaller than the lower ones in each pair; ovary and capsule densely pubescent. 2. *I. balsamina*

1. ***Impatiens wallerana*** Hook. f. in Oliver, Fl. Trop. Afr. 1: 302. 1868; Grey-Wilson in Fl. Masc. Fam. 64. 1. fig. 6–9. 1979.

Impatiens sultani Hook. f. in Bot. Mag. 108: t. 6643. 1882; J. W. Parham, Pl. Fiji Isl. ed. 2. 345. 1972.

As seen in Fiji, *Impatiens wallerana* is sparingly cultivated at elevations of about 200–750 m. as a succulent herb 30–90 m. high. The flowers (noted in March and July) are variously colored, with sepals and petals usually red or scarlet (recorded as white or pink in cultivars).

TYPEFICTION: The type of *Impatiens wallerana* is *Waller s. n.* (K HOLOTYPE), collected in Mozambique in August, 1864; that of *I. sultani* was obtained in Zanzibar, apparently by John Kirk.

DISTRIBUTION: Indigenous in tropical Africa, *Impatiens wallerana* is a garden favorite in many warm countries; it has not been observed naturalized in Fiji.

LOCAL NAME AND USE: To this garden ornamental the name *Japanese balsam* has been applied in Fiji.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Nandarivatu, *Smith 5021*. NAITASIRI: Toninaiwau, Tholo-i-suva, *DA 16769*.

2. ***Impatiens balsamina*** L. Sp. Pl. 938. 1753; Christophersen in Bishop Mus. Bull. 128: 133. 1935; Yuncker in op. cit. 178: 79. 1943, in op. cit. 220: 176. 1959; J. W. Parham, Pl. Fiji Isl. 253. 1964, ed. 2. 345. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 48. 1970; Grey-Wilson in Fl. Masc. Fam. 64. 2. fig. 10–15. 1979.

Impatiens balsamina is commonly cultivated in Fiji at elevations from near sea level to about 250 m., as a succulent herb 20–60 cm. high, the stem and branchlets sometimes purplish-tinged. The species is notable for a wide range of flower colors, the sepals and petals varying from white to rich pink or red to purple. Flowers and fruits have been seen between March and July.

TYPEFICTION: *Impatiens balsamina* was presumably based by Linnaeus on cultivated plants.

DISTRIBUTION: Indigenous in southeastern Asia, *Impatiens balsamina* is now cultivated in many warm parts of the world and is sometimes naturalized. It is said to be so naturalized in Fiji, but the available specimens are all from gardens.

LOCAL NAMES AND USE: *Balsam* is the name usually applied to this popular garden ornamental.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Toninaiwau, Tholo-i-suva, *DA 16768*; Principal Agricultural Station, Koronivia, *DA 12123*. REWA: Mbaniwai road, Suva, *DA 12091*. OVALAU: Lovoni Village, *Smith 7478, 7479*.

ORDER ARALIALES

KEY TO FAMILIES

- Trees or shrubs (all our representatives) (infrequently lianas or perennial herbs); inflorescences simply or compoundly racemose, spicate, umbelliform, or capitate; petals (3-) 5 (-many); stamens as many as petals or twice as many or numerous; carpels (1-) 2-5 (-many); fruit drupaceous or baccate (very rarely a schizocarp, but not in our genera). 144. ARALIACEAE
- Annual or perennial herbs (all our representatives) (rarely suffrutescent or shrubby); inflorescences simple or compound umbels or capitate; petals 5; stamens 5; carpels consistently 2; fruit a schizocarp composed of 2 commissural mericarps, these usually splitting apart at maturity and suspended from a central carpophore. 145. APIACEAE

FAMILY 144. ARALIACEAE

ARALIACEAE Juss. Gen. Pl. 217, as *Araliae*. 1789.

Trees or shrubs (or lianas, scandent epiphytes, or perennial herbs), often with stellate indument, often dioecious, polygamodioecious, or polygamomonoeious, the branches often stout, the stipules distinct or adnate to petiole, often produced into a ligule, or lacking; leaves alternate, rarely opposite or verticillate, often clustered at ends of branchlets, often large, pinnately or digitately compound or decompound, sometimes simple and then entire or pinnately or palmately lobed, the petiole frequently broad and sheathing; inflorescences terminal or lateral, simply or compoundly racemose, spicate, umbelliform, or capitate, the bracts small, usually caducous, the flowers ♂ or unisexual, actinomorphic, epigynous (rarely hypogynous), often 5-merous, the pedicel sometimes articulated under flowers; calyx limb annular to cupular, or the lobes reduced (rarely obsolete); petals (3-) 5 (-many), valvate or slightly imbricate, sometimes connate at base or forming a calyptra, inserted at edge of a fleshy, epigynous, nectariferous disk, caducous; stamens often as many as petals and alternate with them or twice as many as petals or more numerous (rarely as many as 500), the filaments filiform or ligulate, the anthers dorsifixed, usually oblong, introrse, dehiscent by longitudinal slits; gynoecium composed of 2-5 (-many) carpels united into a compound, inferior ovary (this rarely semi-inferior or superior, rarely unilocular), the ovules solitary in each locule, anatropous, pendulous, epitropous (with ventral raphe), the styles as many as locules, distinct or partially or completely connate (rarely suppressed), usually enlarged at base into a stylopodium, the stigmas terminal or decurrent; fruit drupaceous or baccate (very rarely a schizocarp), the endocarp usually cartilaginous or membranaceous, the seeds solitary in each pyrene, with a small embryo and abundant endosperm.

DISTRIBUTION: Pantropical and subtropical, extending into temperate areas, with 50-70 genera and perhaps 1,000-1,150 species. Four genera are represented in Fiji by indigenous species, one by a cultivated and naturalized species.

USEFUL TREATMENTS OF FAMILY: HARMS, H. *Araliaceae*. Engl. & Prantl, Nat. Pflanzenfam. III. 8: 1-62. 1894. HUTCHINSON, J. *Araliaceae*. Gen. Fl. Pl. 2: 52-81. 1967. SMITH, A. C., & B. C. STONE. Studies of Pacific Island plants, XIX. The Araliaceae of the New Hebrides, Fiji, Samoa, and Tonga. J. Arnold Arb. 49: 431-501. 1968. FRODIN, D. G. Studies in Schefflera (Araliaceae): the Cephaloschefflera complex. J. Arnold Arb. 56: 427-448. 1975. PHILIPSON, W. R. *Araliaceae*. Fl. Males. I. 9: 1-105. 1979.

The arrangement of the family proposed by Harms (1894) seems more acceptable to recent specialists in its general outlines (Philipson, 1979, p. 6) than that of Hutchinson (1967), but a consensus of opinion as to generic limits has not been reached. Current inclusive concepts of such genera as *Polyscias* (Philipson, 1979) and *Schefflera* (Frodin, 1975; Philipson, 1979) remain to be thoroughly expressed on a worldwide basis. For present purposes I continue to recognize the genera *Brassaia* and *Plerandra* as readily separable from *Schefflera*. While such recognition presents no significant problems on a fairly local level, these two genera may indeed be recognized by future specialists as sections of an inclusive *Schefflera*. The following treatment is for the most part abstracted from the earlier review by Smith and Stone (1968).

KEY TO GENERA

- Leaves simple; plants dioecious (or sometimes monoecious?); inflorescences racemose or paniculate, the flowers unisexual, sessile, capitulate or congested on ultimate inflorescence branches; petals and stamens usually 4 or 5; ovary 5-12-locular, the styles free. 1. *Meryta*
- Leaves imparipinnate or pinnately or digitately compound or unifoliolate; plants hermaphrodite, polygamodioecious, or polygamomonocious.
- Pedicels articulated below flowers; leaves imparipinnate or pinnately compound or unifoliolate, the rachis articulated; inflorescences usually paniculate or compound-umbelliform; stamens as many as petals. 2. *Polyscias*
- Pedicels not articulated below flowers; leaves digitately compound.
- Stamens indefinite in number (15-500), rarely only 3 times as many as petals; inflorescences compound-umbellate (or -pseudoumbellate, with flowers merely congested on distal portions of short rays); ovary 5-19-locular. 3. *Plerandra*
- Stamens as many as petals (or sometimes more numerous, but not more than twice as many).
- Flowers (in all our species) pedicellate, in stalked umbellules (elsewhere sometimes in capitula, racemes, or spicules), lacking conspicuous basal bracteoles; ovary 4-12-locular; inflorescences paniculate-racemose or compound-umbellate; indigenous species. 4. *Schefflera*
- Flowers sessile in capitula, each subtended by 4 large, winglike, imbricate basal bracteoles; ovary 8-30-locular; inflorescences paniculate, with radiating branches; cultivated and naturalized. 5. *Brassaia*

1. MERYTA J. R. & G. Forst. Char. Gen. Pl. 60. 1775, ed. 2. 119. 1776; Seem. Fl. Vit. 118. 1866; Harms in Notizbl. Bot. Gart. Berlin 14: 315. 1938; Hutchinson, Gen. Fl. Pl. 2: 74. 1967; A. C. Sm. & Stone in J. Arnold Arb. 49: 434. 1968.

Dioecious (or sometimes monoecious?) trees or shrubs; leaves simple, the blades usually entire; inflorescences racemose or paniculate, the flowers sessile, unisexual, crowded, capitulate or congested on ultimate inflorescence branchlets (heads or separate flowers bracteate), the ♀ larger than the ♂; calyx limb 3-5-dentate or obsolete; petals 4 or 5 (-9?), valvate, sometimes subsistent; stamens (3?-) 4 or 5 (-9?) (sterile or lacking in ♀ flowers), the filaments filiform, the anthers ovate-oblong; ovary (rudimentary or none in ♂ flowers) 5-12-celled, with free, often recurved styles; fruits congested, usually capitate, ovoid to globose or oblate, often laterally connate, sometimes costate, the disk in fruit subcallose, the styles long-persistent, the exocarp fleshy, the pyrenes compressed.

TYPE SPECIES: *Meryta lanceolata* J. R. & G. Forst.

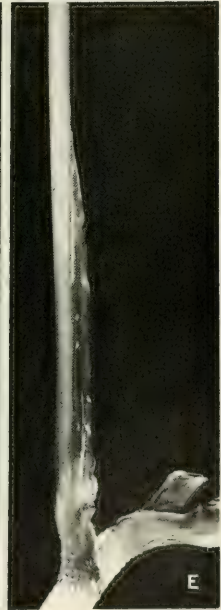
DISTRIBUTION: Widespread in the Pacific, reported from New Zealand, Norfolk Island, New Guinea, and the Palau Islands on the west to the Marquesas and Tuamotus on the east, with about 16-30 species. The genus appears to center in New Caledonia and is greatly in need of a complete revision. It had been considered strangely lacking from Fiji (Smith and Stone, 1968) but is now known there from a single collection.

The relationship of the Fijian endemic *Meryta* does not appear to be with species of such adjacent archipelagoes as the New Hebrides and Samoa, but rather with such Polynesian species as *M. choristantha* Harms, of Rapa. Additional collections of all species of *Meryta* are urgently required for a satisfactory understanding of the genus.

1. *Meryta tenuifolia* A. C. Sm. in Pacific Sci. 25: 499. 1971. FIGURE 153A-C.

Tree about 15 m. high, with a fluted bole and a girth breast-high of 203 cm. (diameter about 65 cm.), rare in montane high forest. No material other than the type collection has become available; that was bearing mature fruit.

FIGURE 153. A-C, *Meryta tenuifolia*; A, distal portion of branchlet, with foliage and an infructescence, × 1/3; B, portion of infructescence, × 4; C, fruits, the upper one subtended by a bracteole and with a subsistent petal, × 8. D, *Polyscias corticata*; lower part of petiole, showing leaf sheath, × 1/2. E, *Polyscias multijuga*; lower part of petiole, showing leaf sheath, × 1/2. A-C from Berry 97, D from Smith 5804, E from Smith 9178.



TIPIFICATION: The type is *Berry 97* (coll. *E. Damanu*) (BISH HOLOTYPE; ISOTYPE at κ), collected Dec. 4, 1968, on a rocky bank of Nggalivava Creek, a northward flowing stream joining Lumunda Creek (Singatoka River tributary) about 1.5 km. south of Vanualevu, Nandronga & Navosa Province, Viti Levu. This area is near the western edge of the Rairaimatuku Plateau, but the above data are somewhat more specific than those originally mentioned; an elevation of about 750–800 m. may be estimated from the 1 : 50,000 map (Viti Levu, sheet 6) published by the Directorate of Overseas Surveys.

DISTRIBUTION: Endemic and known only from the type collection.

LOCAL NAME: *Lutulutu*.

2. POLYSCIAS J. R. & G. Forst. Char. Gen. Pl. 32. 1775, ed. 2. 63. 1776; Seem. in J. Bot. 3: 179. 1865; Harms in Engl. & Prantl, Nat. Pflanzenfam. III. 8: 43. 1894, in Bot. Jahrb. 56: 409. 1921; Hutchinson, Gen. Fl. Pl. 2: 75. 1967; A. C. Sm. & Stone in J. Arnold Arb. 49: 437. 1968; Philipson in Blumea 24: 169. 1978, in Fl. Males. I. 9: 72. 1979.

Nothopanax Miq. in Bonplandia 4: 139. (May) 1856, Fl. Ned. Ind. 1 (1): 765. (July) 1856; Seem. Fl. Vit. 113. 1866, in J. Bot. 4: 293, p. p. 1866.

Shrubs or trees; leaves imparipinnate, infrequently pinnate-compound or unifoliate, often with a sharply acrid fragrance, the petiole terete, sheathing at base, often obviously so but sometimes the leaf sheath short or obsolete, the rachis articulated, the leaflets opposite, the blades entire to crenate or dentate; inflorescences terminal or axillary, often large, usually paniculate or compound-umbelliform, the flowers in racemes, capitula, or umbels, the pedicels articulated below flower; calyx limb reduced to an undulate or dentate rim; petals usually 4 or 5 (–8 or more), valvate, free or loosely coherent; stamens as many as petals, the anthers oblong to ovate; disk flat or subconical; ovary inferior, 2–5(–8 or more)-locular, the styles free and becoming recurved or connate into a stylopodium; fruit drupaceous, globose to ovoid, often drying costate, the calyx limb and styles (or stylopodium) persistent, the exocarp fleshy, the endocarp chartaceous, the seeds sometimes with fissured endosperm.

TYPE SPECIES: *Polyscias* is based on *P. pinnata* J. R. & G. Forst. (= *P. scutellaria* (Burm. f.) Fosberg). The lectotype species of *Nothopanax* is *N. fruticosum* (L.) Miq. (= *P. fruticosa* (L.) Harms) (cf. Merr. in Philipp. J. Sci. Bot. 12: 241. 1912; A. C. Sm. & Stone, 1968, p. 438).

DISTRIBUTION: Paleotropical, eastward in the Pacific to the Society Islands, with about 100 species. In Fiji four species are indigenous (three of them endemic) and four occur in cultivation.

Polyscias is here accepted in the broad sense outlined by Philipson (1978, 1979), as it had also been by Smith and Stone (1968). In this sense the unifying character is the articulation of the pedicel below the flower, but it must be noted that in this circumscription neither the number of ovary locules and styles (whether basically 2 or 5) nor the degree of fusion of styles is of primary consequence. Although Philipson's generic description indicates the ovary to be 4- or 5(–8 or more)-celled, he includes in the genus many species with 2 ovary locules. The Fijian species appear assignable to three of the five sections recognized by Philipson (1978, 1979) for the Malesian species.

KEY TO SPECIES

Leaf sheath elongated, the petiole obviously alate proximally with a clasping base at least 1 cm. long (sect. *Polyscias*).

Leaves once-pinnate (sometimes unifoliolate in no. 3).

Styles and ovary locules 2 (perhaps rarely 3); leaves with (9-) 13-25 (-29) leaflets, the blades oblong to ovate-elliptic, (9-) 12-30 × (3-) 4-12.5 cm., entire or with a few callose-denticulate crenations; indigenous species.

Petioles alate in the proximal 3-8 cm.; inflorescences racemose-paniculate, not much exceeding 50 cm. in total length, the axes griseo-corticate-lenticellate; flowers borne in umbels on ultimate peduncles 10-20 mm. long, 5-15 per umbel, the pedicels 2-6 mm. long. 1. *P. corticata*

Petioles conspicuously alate in the proximal 7-20 cm.; inflorescences compound-racemose-paniculate, usually 100-150 cm. long, the axes smooth, dark; flowers borne in umbels on ultimate peduncles 1-6 mm. long (or umbels subsessile), (1-) 2-7 per umbel, the pedicels less than 1 mm. long. 2. *P. multijuga*

Styles and ovary locules 3-5 (rarely 2); leaves with 1-15 leaflets, the blades variously incised or dentate or coarsely crenulate, rarely subentire, sometimes lobed; petioles alate in the proximal 1-6 cm.; cultivated species.

Leaflets 1-9, the blades usually green but often variegated with white margins or areoles.

Leaflets 1-5, the blades broadly elliptic or orbicular, usually 8-22 cm. long and broad, cordate or broadly concave (rarely truncate) at base, rounded at apex, coarsely crenulate (rarely subentire) at margin, sometimes subpalmately lobed. 3. *P. scutellaria*

Leaflets 5-9, the blades usually elliptic to oblong and 6-12 × 4-8 cm. (sometimes larger), obtuse to acute at base and apex, irregularly spinulose-dentate at margin.

4a. *P. guilfoylei* var. *guilfoylei*

Leaflets (in our cultivar) usually 13 or 15, the blades turning pale yellow, narrowly oblong-lanceolate, 10-20 × 2-5 cm., conspicuously pinnate-lobed, the lobes usually inconspicuously dentate.

5. *P. cumingiana*

Leaves irregularly pinnate-compound, usually 2- or 3-times divided but rarely simply pinnate (and then with some leaflet blades pinnatifid or lacinate); petioles alate in the proximal 1-3 cm.; cultivated species.

Styles and ovary locules 3-5; leaflet blades very variable in shape, some usually elliptic to oblong, the marginal teeth usually 1-3 mm. long. 4b. *P. guilfoylei* var. *laciniata*

Styles and ovary locules 2 (rarely 3); ultimate leaflet divisions usually lanceolate and 3-6 times as long as broad, the marginal teeth irregular, some of them usually 5-10 mm. long. 6. *P. fruticosa*

Leaf sheath obsolete, the petiole swollen at base, adaxially sulcate but neither alate nor clasping; styles and ovary locules 2, the styles divergent in fruit; indigenous species.

Flowers borne singly, alternate or loosely whorled on ultimate inflorescence branches, the pedicels to 1 mm. long in flower and 2 mm. long in fruit; petioles 10-18 cm. long, the leaflets 7-15, with petiolules usually 5-20 mm. long and blades 5-11 × (2-) 3-5 cm., undulate-serrulate at margin (sect. *Gelibia*).

7. *P. joskei*

Flowers borne in umbellules of 11-32, the pedicels 3-4 mm. long; petioles 5-9 cm. long, the leaflets 19-23, with lateral petiolules 4-6 mm. long and blades 5-7 × 2.5-3 cm., entire at margin (sect. *Eupteron*).

8. *P. culminicola*

1. *Polyscias corticata* Gibbs in J. Linn. Soc. Bot. 39: 149. *pl. 13, fig. 14-17*. 1909; J. W. Parham, Pl. Fiji Isl. 86. 1964, ed. 2. 127. 1972; A. C. Sm. & Stone in J. Arnold Arb. 49: 445. *pl. 2, fig. 10-14*. 1968.

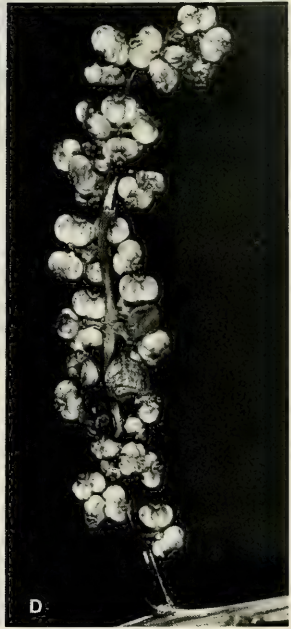
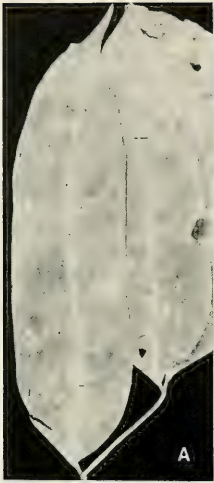
FIGURES 153D, 154A & B.

Tree or shrub 1.5-5 m. high, slender, unbranched or few-branched, occasional in dense or dark forest at elevations of 300-975 m. The inflorescences, congested among the leaves, have the calyx purplish or reddish, the petals rich purple without and pale green within at anthesis, and the stamens and styles pale yellow. Flowers have been noted in scattered months, fruits in March and October.

TIPIFICATION: The type is *Gibbs 769* (BM HOLOTYPE; ISOTYPE at K; photo at US), collected in October, 1907, in the vicinity of Nandarivatu, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known from the two largest islands.

LOCAL NAMES: *Sole*, *ndravi*, *ndanindani*.



AVAILABLE COLLECTIONS: VITI LEVU: MBA: Nandala, south of Nandarivatu, *Degener 14834*; Mt. Matomba, Nandala, *Degener 14458*; Nauwangga, south of Nandarivatu, *Degener 14806*; hills between Nggaliwana and Nandala Creeks, south of Nauwangga, *Smith 5804*; vicinity of Navai, *O. & I. Degener 32109*; Mt. Tomanivi, *DA 12697 (Melville et al. 7085)*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 12561, 12641 (Melville et al. 7014)*. VANUA LEVU: THAKAUNDRIVE: Southern slopes of Korotini Range, below Navitho Pass, *Smith 510*; southwestern slope of Mt. Mbatini, *Smith 611*.

Polyscias corticata and *P. multijuga*, with the endemic Samoan *P. samoensis* (A. Gray) Harms, form a compact group of related species, but the differences among them are obvious (Smith and Stone, 1968).

2. ***Polyscias multijuga*** (A. Gray) Harms in Engl. & Prantl, Nat. Pflanzenfam. III. 8: 45. 1894; Yuncker in Bishop Mus. Bull. 178: 92. 1943, in op. cit. 220: 207. 1959; A. C. Sm. & Stone in J. Arnold Arb. 49: 447, pl. 2, fig. 1-9. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 47. 1970; St. John & A. C. Sm. in Pacific Sci. 25: 336. 1971; J. W. Parham, Pl. Fiji Isl. ed. 2. 129. 1972. FIGURES 153E, 154C & D.

Paratropia multijuga A. Gray, Bot. U. S. Expl. Exped. I: 722. 1854; Seem. in Bonplandia 9: 256. 1861, Viti, 437. 1862.

Nothopanax multijugum Seem. Fl. Vit. 115. t. 18, 19. 1866, in J. Bot. 4: 295. 1866; J. W. Parham, Pl. Fiji Isl. 83. 1964.

Panax multijugum Benth. in Benth. & Hook. f. Gen. Pl. 1: 938. 1867.

Panax multijugum Benth. & Hook. f. ex Drake, Ill. Fl. Ins. Mar. Pac. 181. 1890; Hemsl. in J. Linn. Soc. Bot. 30: 180. 1894.

Tree 2-15 m. high, usually indicated as slender, sometimes unbranched, with a trunk up to 20 cm. in diameter, often abundant in dense or open forest or on its edges at elevations from near sea level to 1,100 m. The young petals and filaments are greenish or yellow, but the petals become dark red or purple without, and the fruits at maturity are purple. Flowers and fruits are available throughout the year.

TYPIFICATION: *Paratropia multijuga* was based on *U. S. Expl. Exped.* (us 47924 & 47925 HOLOTYPE; ISOTYPE at GH), collected in 1840 in the vicinity of Mbua Bay, Mbua Province, Vanua Levu.

DISTRIBUTION: Fiji, Tonga, Niue, and the Horne Islands. In Fiji this is the most abundant and widespread species of *Polyscias*, now known from 16 islands and about 60 collections.

LOCAL NAMES: In addition to the usual name *ndanindani*, *sole*, *sole ngga*, and *sole katangane* have been recorded on Viti Levu, *wala nimmernggua* in the Yasawas.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Nangua, *St. John 18104*. VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 297*; Mt. Nanggaranambuluta, east of Nandarivatu, *Gillespie 4295*. NANDRONGA & NAVOSA: Northern portion of Rairaimatuku Plateau, between Nandrau and Nanga, *Smith 5480*. SERUA: Hills north of Ngaloa, in drainage of Wainiggere Creek, *Smith 9178*; upper Navua River, *DA 15512*. NAMOSE: Vicinity of Namosi, *Seemann 205*. RA: Saulangitua, vicinity of Rewasa, near Vaileka, *Degener 15499*. NAITASIRI: Wainamo Creek, near Matawailevu, Wainimala River, *St. John 18246*. REWA: Mt. Korombamba, *Gillespie 2210*. MBENGGGA: Malambi, *Weiner 217*. KANDAVU: Hills above Namalata and Ngaloa Bays, *Smith 122*. OVALAU: Mt. Tana Lailai, *Graeffe*. KORO: Eastern slope of main ridge, *Smith 937*. NGAU: Hills east of Herald Bay, inland from Sawaieke, *Smith 7743*. VANUA LEVU: MATHUATA: Mt. Ndelaikoro, *DA 11498*. THAKAUNDRIVE: Savusavu Bay region, *Degener & Ordonez 15545*; southern slope of Valanga Range, *Smith 365*. TAVEUNI: Vicinity of Waiyevo, *Gillespie 4711*. MOALA: In lowland forest, *Bryan 297*. YATHATA: Navakathuru, *DA 16306*. VANUA MBALAVU: Near Narothivo Village, *Garnock-Jones 1123*. LAKEMBA: Near airport, *Garnock-Jones 871*. AIWA: Central wooded basin, *Bryan 525*. KAMBARA: On limestone formation, *Smith 1299*. ONGEA LEVU: *Bryan 427*.

FIGURE 154. A & B, *Polyscias corticata*; A, leaflets, $\times 1/3$; B, portion of inflorescence, $\times 2$. C & D, *Polyscias multijuga*; C, leaflets, $\times 1/3$; D, ultimate branchlet of infructescence, $\times 2$. A from *Degener 14458*, B from *Smith 510*, C from *Smith 365*, D from *Smith 937*.

3. *Polyscias scutellaria* (Burm. f.) Fosberg in Occas. Pap. Univ. Hawaii **46**: 9. 1948; Stone in Taxon **14**: 284. 1965; A. C. Sm. & Stone in J. Arnold Arb. **49**: 452. *pl. 1, fig. 13, 14*. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 47. 1970; J. W. Parham, Pl. Fiji Isl. ed. 2. 129. 1972; Philipson in Fl. Males. I. **9**: 75. 1979.

Crassula scutellaria Burm. f. Fl. Ind. 78. 1768.

Polyscias pinnata J. R. & G. Forst. Char. Gen. Pl. 32. *pl. 32*. 1775, ed 2. 64. *pl. 32*. 1776; Forst. f. Fl. Ins. Austr. Prodr. 90. 1786; Seem. in J. Bot. 3: 180. 1865; Stone in Taxon **14**: 282. 1965.

As seen in Fiji, *Polyscias scutellaria* is abundantly cultivated near sea level as a shrub or small tree 1.5–4 m. high, with leaves entirely green or with blades sometimes white-tinged or dull yellowish at margins. It is rarely seen in flower, but then the petals are white.

TYPOIFICATION AND NOMENCLATURE: *Crassula scutellaria* was based entirely on *Scutellaria prima* Rumph. Herb. Amb. **4**: 75. *t. 31*. 1743. *Polyscias pinnata* was described from two collections made on Tanna, New Hebrides; of these the lectotype has been designated as *Anderson* (BM LECTOTYPE; photo at US) by Stone (1965) and Smith and Stone (1968). More ample synonymies for this widespread cultivated plant are given by the latter authors as well as by Philipson (1979).

DISTRIBUTION: Widely dispersed in cultivation throughout the paleotropics, but perhaps indigenous in the Solomon Islands and the New Hebrides (Smith and Stone, 1968).

LOCAL NAME AND USES: This cultivated *ndanindani* is an ornamental often used in hedges; juice from the leaves is reputed to be used in relieving toothache and also in facilitating childbirth.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Naseuvou Village, Waindina River, *Weiner 269*. REWA: Lami, in private garden, *DA 16444, 16470*; Suva Botanical Gardens, *DA 12300*. TAVEUNI: Korovou Village, *Weiner 71-7-87*.

Specimens cited above suggest the wild form represented by the type of *Polyscias pinnata*, with three or five suborbicular, undivided leaflets, but sometimes the leaves are unifoliolate. There are many cultivars, one of which, cv. 'Tricochleata' (cf. Smith and Stone, 1968, for synonymy), with leaflets further divided and blades often with spinulose-serrate margins, is frequently grown in the Pacific and is represented in Fiji by:

VITI LEVU: REWA: Lami, in private garden, *DA 16468*; Suva, *Degener & Ordonez 13542*. TAILEVU: Mburerua Village, Sawakasa Tikina, *Weiner 72-7-69*.

4. *Polyscias guilfoylei* (Bull.) L. H. Bailey in Rhodora **18**: 153. 1916; A. C. Sm. & Stone in J. Arnold Arb. **49**: 455. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 46. 1970; Philipson in Fl. Males. I. **9**: 76. 1979.

Shrub or small tree, usually with suberect and virgate branches, the leaflet blades variously shaped and incised, usually green but often with whitish margins or variegations. There are various forms, probably cultivars, which are sometimes treated as varieties. Two are frequently cultivated in the Fijian Region.

KEY TO VARIETIES

Leaflet blades elliptic to oblong, spinulose-dentate at margin. 4a. var. *guilfoylei*
 Leaflet blades deeply and irregularly divided or decomposed, the ultimate parts variously incised and lacinate. 4b. var. *laciniata*

- 4a. *Polyscias guilfoylei* var. *guilfoylei*; A. C. Sm. & Stone in J. Arnold Arb. **49**: 456. 1968; J. W. Parham, Pl. Fiji Isl. ed. 2. 129. 1972.

Aralia guilfoylei Bull, Cat. 1873; Cogn. & March. Pl. Ornament. **2**: *pl. 58*. 1874.

Nothopanax guilfoylei Merr. in Philipp. J. Sci. Bot. 7: 242. 1912; Christophersen in Bishop Mus. Bull. 128: 165. 1935; Yuncker in op. cit. 220: 207. 1959; J. W. Parham, Pl. Fiji Isl. 83. 1964; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 122. 1972.

Polyscias guilfoylei L. H. Bailey in Rhodora 18: 153. 1916; Yuncker in Bishop Mus. Bull. 178: 91. 1943.

The type-including variety, with leaflet blades usually elliptic to oblong and 6–12 × 4–8 cm., conspicuously and irregularly spinulose-dentate at margin.

TYPIFICATION: Bull indicated the type merely as from the "South Sea Islands," but it may have been brought back by W. R. Guilfoyle from the islands between Samoa and New Caledonia visited by H. M. S. *Challenger* in 1868 (cf. Guilfoyle in J. Bot. 7: 117–136. 1869; Smith and Stone, 1968).

DISTRIBUTION: Widely cultivated in the paleotropics and in some parts of the neotropics. It is often seen in Suva as a hedge plant but no Fijian collections are at hand.

LOCAL NAME AND USE: *Ndanindani*; a garden ornamental most often grown in hedges which, if not tended, grow to a height of 6 or 7 m.

4b. *Polyscias guilfoylei* var. *laciniata* (Hort.) L. H. Bailey in Rhodora 18: 153. 1916; Christophersen in Bishop Mus. Bull. 128: 165. 1935; Yuncker in op. cit. 178: 92. 1943; A. C. Sm. & Stone in J. Arnold Arb. 49: 457. 1968; St. John & A. C. Sm. in Pacific Sci. 25: 336. 1971; J. W. Parham, Pl. Fiji Isl. ed. 2. 129. 1972.

Panax fruticosum sensu Seem. in Bonplandia 9: 256. 1861, Viti, 437. 1862; non L.

Panax laciniatus Hort. in Gard. Chron. II. 13: 759. 1880.

Polyscias guilfoylei cv. 'Laciniata' Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 46. 1970.

Nothopanax guilfoylei var. *laciniata* L. H. Bailey ex B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 122. 1972.

The more finely divided leaves separate this form from the typical form, some of the leaflet blades being deeply lobed or decomposed, although readily separable in shape from those of *Polyscias fruticosa*.

TYPIFICATION: The original material may have come from the Pacific islands along with that of the typical form. This variation is probably better treated as a cultivar, as suggested by Sykes (1970), rather than as a botanical variety.

DISTRIBUTION: Perhaps less widespread in cultivation than var. *guilfoylei*, although in the Fijian Region it may be more abundant.

LOCAL NAME AND USE: As for the typical variety.

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Lami, in private garden, DA 16445. FIJI without further locality, Seemann 204, Horne 588.

5. *Polyscias cumingiana* (Presl) Fern.-Vill. Nov. App. 102. 1880; Philipson in Fl. Males. I. 9: 76. 1979.

Paratropia cumingiana Presl, Epimel. Bot. 250. 1851, in Abh. Böhm. Ges. Wiss. V. 6: 610. 1851.

Nothopanax cumingii (sic) Seem. Fl. Vit. 114. 1866.

Aralia filicifolia C. Moore ex Fourn. in Ill. Hort. 23: 72. pl. 240. 1876.

Polyscias filicifolia L. H. Bailey in Rhodora 18: 153. 1916; J. W. Parham, Pl. Fiji Isl. ed. 2. 128. 1972.

As seen in Fiji, *Polyscias cumingiana* is occasionally cultivated near sea level as a shrub 3–4 m. high, probably always sterile in cultivation, with narrow, pinnate-lobed leaflets inclined to be yellowish.

TYPIFICATION: The type designated by Presl is *Cuming 1553*, from Mindoro, Philippine Islands.

DISTRIBUTION: Probably indigenous in parts of Malesia, now widely cultivated in tropical areas.

LOCAL NAME AND USE: *Ndanindani*; a garden ornamental sometimes used in hedges.

AVAILABLE COLLECTION: VITI LEVU: REWA: Lami, in private garden, DA 16471.

Seemann's name *Nothopanax cumingii* was proposed as a new combination based on *Paratropia cumingiana*, but at that date the species had not been observed in Fiji. In fact, it is probably a recent introduction, the only available collection having been made in 1969, at which time occasional plants were observed in gardens in Suva.

Polyscias cumingiana is a complex of forms (cultivars?), as noted by Philipson (1979, p. 77), but there should be no question of its confusion with *P. pinnata*, which is clearly assignable to a reasonable concept of *P. scutellaria* (Smith and Stone, 1968, pp. 452-455). The form of *P. cumingiana* noted in Fiji, with narrow, pinnate-lobed leaflets inclined to be yellowish, is probably a cultivar first described as *Aralia filicifolia*.

6. *Polyscias fruticosa* (L.) Harms in Engl. & Prantl, Nat. Pflanzenfam. III. 8: 45. 1894; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 97. 1948; A. C. Sm. & Stone in J. Arnold Arb. 49: 458. pl. 3, fig. 7-9. 1968; J. W. Parham, Pl. Fiji Isl. ed. 2. 129. 1972; Philipson in Fl. Males. I. 9: 73. 1979.

Panax fruticosum L. Sp. Pl. ed. 2. 1513. 1763; A. Gray, Bot. U. S. Expl. Exped. 1: 716. 1854; Drake, Ill. Fl. Ins. Mar. Pac. 181. 1890.

Nothopanax fruticosum Miq. in Bonplandia 4: 139. (May) 1856, Fl. Ned. Ind. 1 (1): 765. (July) 1856; Seem. Fl. Vit. 114, 115. 1866, in J. Bot. 4: 294. 1866; Yuncker in Bishop Mus. Bull. 220: 207. 1959; J. W. Parham, Pl. Fiji Isl. 83. 1964.

Tieghemopanax fruticosus Viguier in Ann. Sci. Nat. IX. Bot. 4: 61. 1906; Guillaumin in J. Arnold Arb. 12: 263. 1931; J. W. Parham, Pl. Fiji Isl. 86. 1964.

Frequently cultivated in villages and gardens in Fiji as a shrub or small tree 1-4 m. high, at elevations from near sea level to about 450 m. The leaves frequently have a yellowish tinge and flowers are often seen between January and June, the petals being white or greenish and the styles white.

TYPIFICATION: The species is based on *Scutellaria tertia* Rumph. Herb. Amb. 4: 78. pl. 33. 1743, a plate doubtless drawn from a cultivated plant.

DISTRIBUTION: Widely cultivated in the tropics of both hemispheres and as a greenhouse plant, probably indigenous in Malesia, although the area of origin is speculative.

LOCAL NAME AND USE: Like many of its relatives, this garden ornamental is known in Fiji as *ndanindani*.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Tumbenasolo, valley of Namosi Creek, Smith 4724. REWA: Lami, in private garden, DA 16441; Suva, in private garden, DA 16223. MBENGGGA: Raviravi Village, Weiner 72-7-21. OVALAU: Lovoni Village, Smith 7496. VANUA LEVU: MBUA: Nambouwalu, DA 16964.

7. *Polyscias joskei* Gibbs in J. Linn. Soc. Bot. 39: 148. 1909; J. W. Parham, Pl. Fiji Isl. 86. 1964, ed. 2. 129. 1972; A. C. Sm. & Stone in J. Arnold Arb. 49: 441. pl. 1, fig. 1-5. 1968.

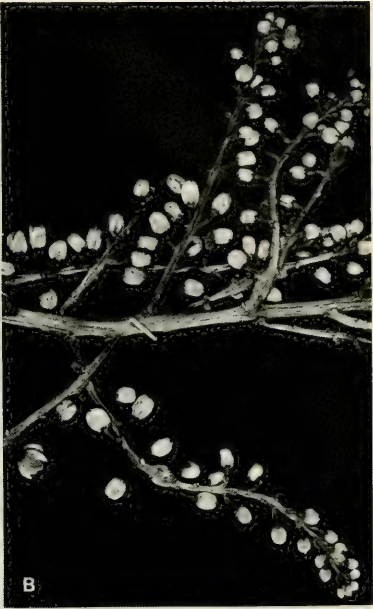
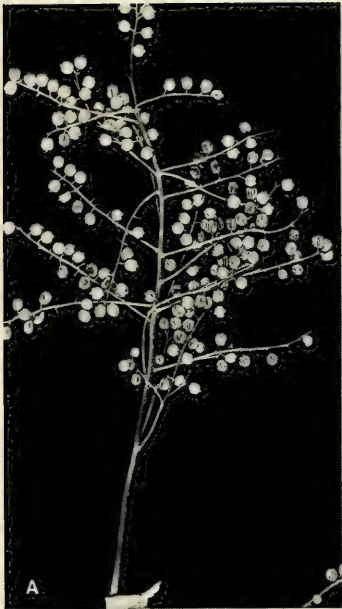
FIGURE 155A & B.

Botryopanax joskei Hutchinson, Gen. Fl. Pl. 2: 57. 1967.

Tree 3-10 m. high, sometimes compact, with thin, pale latex, found at elevations of 575-1,150 m. in dense forest or in the thickets of ridges and crests. The distal parts of inflorescence branches and the pedicels are purple, the petals are yellow, and the young fruits are purple, with pale yellow styles. Flowers are known to occur between July and November, and fruits have been obtained in September, November, and May.

TYPIFICATION: The type is Gibbs 748 (BM HOLOTYPE; ISOTYPE at K; photo at US), collected in flower and fruit near Nandala, south of Nandarivatu, Mba Province, Viti

FIGURE 155. A & B, *Polyscias joskei*; A, lateral branch of infructescence, $\times 1/2$; B, portion of inflorescence, $\times 2$. C, *Polyscias culminicola*; portion of inflorescence, $\times 2$. D, *Schefflera euthytricha*; ultimate branchlets of inflorescence, $\times 2$. A from Smith 568, B from Smith 4975, C from Smith 4514, D from Smith 8908.



Levu, in September, 1907. Gibbs originally cited her collections as 750 (in fruit) and 893 (with ♂ flowers); fragmentary specimens numbered 748 and 750 are found at κ. At BM two collections are combined on a single sheet bearing the number 748, with no indication of Gibbs's original numbers.

DISTRIBUTION: Endemic to Fiji and now known from three of the high islands. The Fijian endemic presumably represents the eastward limit of sect. *Gelibia*; it differs sharply from the related *Polyscias elegans* (C. Moore & F. v. Muell.) Harms, of New Guinea and Australia, in having the leaves only once-pinnate and in details of indument (lacking in our species) and inflorescences.

LOCAL NAMES: *Nausasa*, *sole yalewa*, and *ndanindani* have been recorded.

AVAILABLE COLLECTIONS: VITI LEVU: Mba: Mt. Evans Range, *Greenwood 1249*; Yavu Creek, Mba River headwaters, *Berry 94*; hills between Nandala and Nukunuku Creeks, along trail from Nandarivatu toward Lewa, *Smith 6161*; vicinity of Nandarivatu, *Degener & Ordenez 13578*; slopes of Mt. Nanggaranambuluta, east of Nandarivatu, *Gillespie 3197, 3914*; ridge between Mt. Nanggaranambuluta and Mt. Namama, *Smith 4975*. NAMOSI: Summit of Mt. Naitarandamu, *Gillespie 3151*; Mt. Voma, *DA 1703*. RA: Ridge from Mt. Namama toward Mt. Tomanivi, *Smith 5685*. OVALAU: Summit of Mt. Ndelaivalau and adjacent ridge, *Smith 7584*. VANUA LEVU: MATHUATA-THAKAUNDROVE BOUNDARY: Crest of Korotini Range, between Navitho Pass and Mt. Ndelaikoro, *Smith 568*; Mt. Ndelaikoro, *DA 12822*. FIJI without further locality, *DA L.13258, L.13360*.

8. *Polyscias culminicola* A. C. Sm. in *Contr. U. S. Nat. Herb.* **37**: 85. 1967; A. C. Sm. & Stone in *J. Arnold Arb.* **49**: 444. *pl. 1, fig. 9-12*. 1968; J. W. Parham, *Pl. Fiji Isl.* ed. 2. 128. 1972.

FIGURE 155C.

Polygamodioecious tree about 8 m. high, apparently rare and known only from crest forest on a wind-swept ridge at elevations of 750-900 m. The leaves are congested at apices of branchlets, the racemose-paniculate and umbelliferous inflorescences are terminal, and the central flowers of some umbels are ♂, although most flowers are ♀.

TIPIFICATION: The type is *Smith 4514* (US 1965344 HOLOTYPE; many ISOTYPES), collected May 27, 1947, on the northern slopes of Mt. Namendre, east of Mt. Koromba (Pickering Peak), Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known only from the type collection.

LOCAL NAME: The name applied to the type collection, *sawira*, may be considered questionable.

Although the styles are only two, they are free (but erect) and probably become spreading in fruit (only very immature fruit available, cf. Smith and Stone, 1968, *pl. 1, fig. 12*). The species is probably best placed in sect. *Eupteron* in Philipson's arrangement (1978, 1979) and may represent its easternmost limit. The six species recognized in this section in Malesia have the styles and ovary locules 3-5, but variability in this character seems acceptable within sections of *Polyscias*.

3. *PLERANDRA* A. Gray in *Proc. Amer. Acad. Arts* **3**: 129. (May) 1854, *Bot. U. S. Expl. Exped.* **1**: 729. (June) 1854, in *Ann. Sci. Nat. IV. Bot.* **4**: 178. 1855; Seem. in *J. Bot.* **2**: 241. 1864, *Fl. Vit.* **117**. 1866; Harms in *Engl. & Prantl, Nat. Pflanzenfam.* **III**. **8**: 28. 1894; A. C. Sm. in *Bishop Mus. Bull.* **141**: 116. 1936, in *J. Arnold Arb.* **36**: 286. 1955; Hutchinson, *Gen. Fl. Pl.* **2**: 61. 1967; A. C. Sm. & Stone in *J. Arnold Arb.* **49**: 466. 1968.

Bakeria Seem. in *J. Bot.* **2**: 248. 1864, *Fl. Vit.* **117**. 1866, op. cit. 429. 1873.

Nesopanax Seem. in *J. Bot.* **2**: 249. 1864, *Fl. Vit.* **116**. 1866.

Polygamodioecious or polygamomonoecious trees or coarse shrubs; leaves large, aggregated toward ends of branchlets, digitately compound, the petioles expanded at base into a ligulate sheath, the leaflets 3-12 (-16), petiolulate, with entire blades;

inflorescences compound-umbellate (or pseudoumbellate, the flowers then merely congested on distal portions of short rays), the umbels (or floriferous rays) radiating from a stout peduncle, subtended by caducous bracts, the pedicels not articulate under flowers, the flowers ♂ or ♀, calyx limb entire or sinuate-dentate, inconspicuous; petals (4 or 5) (or 6), valvate, ovate or deltoid to oblong, often carnosae, coherent and calyptrate, less often completely free; stamens indefinite (15–500), 1–several-seriate, rarely only 3 times as many as petals, the filaments filiform, the anthers oblong; disk flattened (in ♂ flowers) or forming a stylopodium (in ♀ flowers); ovary 5–19-locular, the styles short, connate to apex (then with stigmas papillate or marginally projecting from stylopodium) or at least proximally in the stylopodium; fruit ellipsoid or oblong-ellipsoid, often sulcate or costate at maturity, 5–19-locular, the exocarp fleshy, the pyrenes compressed-triangular or lunulate, crustaceous, the seeds with rugose or ruminate endosperm.

TYPE SPECIES AND NOMENCLATURE: *Plerandra* and its type species, *P. pickeringii* A. Gray, were first published in May, 1854, in a descriptio generico-specifica (not listed in ING, 1979). *Bakeria* is based on *B. vitiensis* Seem. (= *Plerandra bakeriana* A. C. Sm.), *Nesopanax* on *N. vitiensis* Seem. (= *Plerandra vitiensis* (Seem.) Baill.). Seemann's two genera were promptly reduced to *Plerandra* by Benth in Benth. & Hook. f. Gen. Pl. 1: 946. 1867, but no specific combinations were made for Seemann's species.

DISTRIBUTION: New Guinea, the Solomon Islands, and Fiji (to be anticipated in the New Hebrides), with about 14 species. Seven endemic Fijian species terminate the generic range to the east.

Unfortunately most BISH specimens of *Schefflera* (sens. lat., including *Plerandra*), fortuitously excluding types, were on loan to UPNG (Port Moresby) at the time of a disastrous fire in 1978. Although some of the BISH specimens have been returned, they are severely charred and in large part worthless. I have not checked other herbaria as to the state of araliaceous material that may have been on loan. The Fijian species of *Plerandra* had all been redescribed by Smith and Stone (1968), and the present treatment merely abstracts from that work, with slight amplifications permitted by collections acquired since 1968.

It is possible that future students of the family will agree with Philipson (1979, p. 7) in submerging *Plerandra* in *Schefflera*; this step is presumably to be taken by Frodin, but it is not discussed in his 1975 treatment of the *Cephaloschefflera* complex. *Plerandra* is here maintained because the extraordinarily large number of stamens makes it easily recognized, and also because the requisite nomenclatural combinations have not yet been made.

KEY TO SPECIES

Inflorescences composed of umbels, the flowers borne at apices of elongate rays rarely less than 5 cm. long and usually much longer.

Stylopodium inconspicuous, in fruit 1–2.5 mm. long, the styles sometimes completely or partially separate, sometimes connate with marginally projecting stigmas.

Styles and ovary locules 5–11; stamens not more than 150; flowers comparatively small, the petals 4–7 mm. long; leaflet blades rarely more than 10 cm. broad.

Stamens usually 1-seriate, 15–20 (–23); styles and ovary locules usually 5 or 6 (rarely 7 or 8); flowers small, the petals about 4 mm. long; fruits 10–12 × 8–10 mm., the stigmas projecting marginally from the truncate-concave apex of the stylopodium; leaflets 5–8 (–10), with petiolules 1–4 (–6) cm. long and blades usually 8–17 × 4–7 cm.; petioles not more than 25 cm. long.

1. *P. bakeriana*

Stamens at least 2-seriate, 25 or more; flowers with petals 5–7 mm. long.

Leaflets 3–6 (–7), with petiolules 1–5 cm. long and blades 7–18 × 3.5–8 cm.; petioles 5–20 cm. long; fruits oblong-ellipsoid, about 20 × 10 mm., the stigmas obviously separate on the truncate-concave apex of the inconspicuous stylopodium; ovary locules 5–8; stamens 50–75.

2. *P. grandiflora*

Leaflets 5-10 (rarely 4-12); fruits ellipsoid, not much longer than broad, 8-14 × 7-11 mm.

Stamens 2-seriate, 25-35; ovary locules 5-8; stylopodium in fruit composed of connate styles and minutely concave at apex; leaflets (4-) 5-7 (-8), with petiolules (1-) 2-4 cm. long and blades usually 8-15 × 3.5-7 cm.; petioles not more than 23 cm. long. . . . 3. *P. victoricae*

Stamens 3-5-seriate, 75-155; ovary locules usually 7-10 (sometimes 5-11); stylopodium in fruit composed of styles connate proximally but free at the spreading or erecto-patent apices; leaflets (6-) 7-10 (-12), with petiolules (1-) 2-5 (-7) cm. long and blades 13-23 (-27) × 4-9 (-10.5) cm., rounded to obtuse at apex; petioles up to 60 cm. long. 4. *P. vitiensis*

Styles and ovary locules (11-) 12-19; stamens 3-5-seriate, 120-250; flowers comparatively large, the petals 8-12 mm. long; fruits 11-35 × 10-30 mm., the stylopodium composed of short, stout styles connate into a centrally concave ring; leaflets (4-) 6-9 (-10), with petiolules 2.5-7 cm. long and blades (11-) 14-30 × (5-) 6-14.5 cm., broadly rounded at apex; petioles up to 60 cm. long.

5. *P. grayi*

Stylopodium obvious, in fruit 5-10 mm. long, conical-cylindric, composed of 9-17 firmly connate styles with stigmas marginal on the truncate apex; stamens numerous, 200-500; flowers large, the petals 9-16 mm. long; fruits large, 20-40 × 17-25 mm.; leaflets (6-) 7-11 (-16), with petiolules (1.5-) 3-13 cm. long and blades 16-40 (-47) × 6-20 (-24) cm.; petioles up to 100 cm. long. 6. *P. pickeringii*

Inflorescences lacking true umbels, the flowers congested distally on short rays (3-8 cm. long) in a strobiluslike pseudoumbel 1-5 cm. long; stamens 50-75; flowers comparatively large, the petals 7-8 mm. long; fruits large, 25-36 × 18-30 mm., with a persistent calycular rim and a short (1-2 mm. long) stylopodium, the 9-12 styles firmly connate; leaflets (5-) 8-11 (-12), with petiolules 2-12.5 cm. long and blades 20-54 × 5-25 cm.; petioles 40-70 cm. long. 7. *P. insolita*

1. *Plerandra bakeriana* A. C. Sm. in Bishop Mus. Bull. **141**: 118. 1936; J. W. Parham, Pl. Fiji Isl. 84, fig. 34. 1964, ed. 2. 126, fig. 36. 1972; A. C. Sm. & Stone in J. Arnold Arb. **49**: 468. pl. 7, fig. 3, 4. 1968.

Araliaceae Seem. in Bonplandia **9**: 256. 1861.

Plerandra sp. nov. A. Gray in Proc. Amer. Acad. Arts **5**: 318. 1862, in Bonplandia **10**: 36. 1862.

Plerandra grayi sensu Seem. Viti, 437, p. p., non sensu typi. 1862.

Bakeria vitiensis Seem. in J. Bot. **2**: 249, fig. (p. 248). 1864, Fl. Vit. 117. t. 21. 1866; Anon. in Gartenfl. **36**: 71. 1887, in Kew Bull. **1888**: 95. 1888.

Plerandra vitiensis Benth. & Hook. f. ex Drake, Ill. Fl. Ins. Mar. Pac. **183**. 1890; Harms in Engl. & Prantl, Nat. Pflanzenfam. III. **8**: 29. 1894; non Baill. (1879).

Tree about 5 m. high, infrequent at elevations between about 200 and 1,100 m. in forest or in ridges and crest thickets, with black fruits. Flowers and fruits have been obtained in August and September.

TYPIFICATION: The type is *Seemann 209* (K HOLOTYPE; ISOTYPE at GH; photos at BISH, US), collected in August or September, 1860, in Namosi Province (probably near Namosi Village), Viti Levu.

DISTRIBUTION: Endemic to Fiji and known only from Viti Levu.

LOCAL NAME: *Sole* (usually used in a generic sense for *Plerandra*).

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mt. Evans Range, *Greenwood 382*. NAMOSI: Mt. Naitarandamu, *Gillespie 3153*; Korombasambasanga Range, *DA 2197*; Mt. Voma, *Gillespie 2712*, *DA 1723*, p. p. VITI LEVU without further locality, *MacGillivray & Milne 99*.

2. *Plerandra grandiflora* A. C. Sm. in Bishop Mus. Bull. **141**: 117, fig. 61. 1936; J. W. Parham, Pl. Fiji Isl. 85. 1964, ed. 2. 126. 1972; A. C. Sm. & Stone in J. Arnold Arb. **49**: 469. 1968.

Shrub or slender tree about 3 m. high, infrequent in dense, low forest and crest thickets at elevations between about 300 and 1,030 m., with pale yellow petals and stamens and black fruits. Flowers have been observed in May and November, fruits only in May.

TYPIFICATION: The species is based on *Smith 1777* (BISH HOLOTYPE; many ISOTYPES), collected May 10, 1934, on Mt. Kasi, Yanawai River region, Thakaundrove Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and known from only two collections from Vanua Levu.

LOCAL NAME: *Ndanindani* (for type collection).

AVAILABLE COLLECTION: VANUA LEVU: THAKAUNDROVE: Summit of Mt. Mbatini, *Smith 680*.

3. *Plerandra victoriae* Gibbs in J. Linn. Soc. Bot. **39**: 150. 1909; A. C. Sm. in Bishop Mus. Bull. **141**: 117, non nisi quoad typum. 1936; J. W. Parham, Pl. Fiji Isl. **86**. 1964, ed. 2. 126. 1972; A. C. Sm. & Stone in J. Arnold Arb. **49**: 470. *pl. 7, fig. 5*. 1968.

Plerandra sp. A. C. Sm. in Bishop Mus. Bull. **141**: 118. 1936.

Compact or slender tree 2–6 m. high, infrequent in the dense forest on crests, ridges, and summits at elevations of 700–1,323 m. The petals are recorded as black without and white within, the stamens as yellow, and the fruits as deep purple, at length becoming black. Flowers were observed in June and September, fruits between July and October.

TYPIFICATION: The type is *Gibbs 784* (BM HOLOTYPE; photo at US), collected in September, 1907, on the summit ridge of Mt. Tomanivi, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and known from very limited areas on the two largest islands.

LOCAL NAME: *Sole*.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Summit and upper slopes of Mt. Tomanivi, *Gillespie 4112*, *Smith 5145*, *DA 13079*. VANUA LEVU: THAKAUNDROVE: Eastern buttress of Mt. Ndikeva, *Smith 1890*.

4. *Plerandra vitiensis* (Seem.) Baill. Hist. Pl. **7**: 169. *fig. 221*. 1879; A. C. Sm. in Bishop Mus. Bull. **141**: 116. 1936; J. W. Parham, Pl. Fiji Isl. **86**. 1964, ed. 2. 126. 1972; A. C. Sm. & Stone in J. Arnold Arb. **49**: 471. *pl. 7, fig. 1, 2*. 1968.

Araliaceae Seem. in Bonplandia **9**: 256. 1861.

Plerandra sp. Seem. Viti, 437. 1862.

Nesopanax vitiensis Seem. in J. Bot. **2**: 249. *fig. 1864*, Fl. Vit. **117**. *t. 20*. 1866; Anon. in Gartenfl. **36**: 71. 1887, in Kew Bull. **1888**: 110. 1888.

Plerandra seemanni Benth. & Hook. f. ex Drake, Ill. Fl. Ins. Mar. Pac. **183**. 1890.

Plerandra nesopanax Harms in Engl. & Prantl, Nat. Pflanzenfam. III. **8**: 29. 1894.

Tree (2–) 5–20 m. high, indicated as slender, sparsely branching, or freely branching, occurring at elevations from near sea level to 1,150 m. in dense or open forest or on its edges. The young petals are dull green, remaining pale green within but turning purple without; the anthers are pale yellow; the stylopodium and styles are white; and the fruit turns from purple to black at maturity. Flowers and fruits have been obtained in most months.

TYPIFICATION: The only type concerned, that of *Nesopanax vitiensis*, is *Seemann 207* (K HOLOTYPE, 2 sheets; ISOTYPES at BM, GH; photos at BISH, US), collected in July, 1860, at Port Kinnaird, Ovalau.

DISTRIBUTION: Endemic to Fiji and thus far known from four islands and 27 collections.

LOCAL NAMES: *Sole*, *sole ngga*, *kaikai*, *ndanindani*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Slopes of Mt. Nairova, eastern flank of Mt. Evans Range, *Smith 4060*; vicinity of Nandarivatu, *Degener 14380*; western slopes of Mt. Nanggaranambuluta, *Smith 4756*; above Navai Village, *Berry 68*; Mt. Tomanivi, *DA 12727* (*Melville et al. 7117*). NANDRONGA & NAVOSA: Northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, *Smith 5422*; north of Komave, *St. John 18965*. NAMOSI: Mt. Vakarongasiu, *Gillespie 3270*. OVALAU: Hills west of Lovoni Valley, on ridge south of Mt. Korolevu, *Smith 7515*; above Levuka, *Gillespie 4533*. VANUA LEVU: MBUA: Southern slopes of Mt. Seatura, *Smith 1621*. MATHUATA: Southern base of Mathuata Range, north of Natua, *Smith 6773*. THAKAUNDROVE: Southern slope of Mt. Mariko, *Smith 412*. YATHATA: Navakathuru, *DA 16198*, 16310.

5. *Plerandra grayi* Seem. in J. Bot. 2: 242. fig. (p. 241). 1864, Fl. Vit. 117. t. 22. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 183. 1890; A. C. Sm. in Bishop Mus. Bull. 141: 116. 1936; J. W. Parham, Pl. Fiji Isl. 85. fig. 35. 1964, ed. 2. 126. fig. 37. 1972; A. C. Sm. & Stone in J. Arnold Arb. 49: 472. pl. 7, fig. 6-9. 1968.

Araliaceae Seem. in Bonplandia 9: 256. 1861.

Plerandra sp. A. Gray in Proc. Amer. Acad. Arts 5: 318. 1862.

Plerandra sp. nov. A. Gray in Bonplandia 10: 36. 1862; Seem. Viti, 437. 1862.

Plerandra graeffei Anon. in Gartenfl. 36: 71. 1887, in Kew Bull. 1888: 117. 1888.

Tree 5-18 m. high, usually slender, found in dense forest or on its edges at elevations from near sea level to 400 m. The young calyx is green, with copious purple markings; the petals are purple-tinged without and greenish white within; the stamens are greenish to cream-white, and the fruits turn black at maturity. Flowers and fruits usually occur together in months scattered throughout the year.

TYPIFICATION: The type is *Seemann 208* (K HOLOTYPE; ISOTYPES *err. no. 209* at BM, GH; photos at BISH, US), collected in July, 1860, probably along the coast of Serua Province, Viti Levu (cf. Smith and Stone, 1968, p. 473). The epithet *graeffei* is evidently an erroneous transcription.

DISTRIBUTION: Endemic to Fiji and, as now known, to Viti Levu.

LOCAL NAME: *Sole*.

AVAILABLE COLLECTIONS: VITI LEVU: SERUA: Inland from Namboutini, *DF 413*; Vatutavathe, vicinity of Ngaloa, *Degener 15201*. NAMOSE: Hills bordering Wainavindrau Creek, vicinity of Wainimakutu, *Smith 8523, 8568*; hills east of Wainikoroiluva River, near Namuamua, *Smith 8902, 9046*. NAITASIRI: Prince's Road, *Meebold 16558, DA 196*; vicinity of Tamavua, *Gillespie 2464*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7140*. REWA: Mt. Korombamba, *Parks 20118, DA 16514*; vicinity of Suva, *Meebold 16555*.

6. *Plerandra pickeringii* A. Gray in Proc. Amer. Acad. Arts 3: 129. (May) 1854, Bot. U. S. Expl. Exped. 1: 729. (June) 1854, Atlas, pl. 95. 1856, in Ann. Sci. Nat. IV. Bot. 4: 178. 1855; Seem. Viti, 437. 1862, in J. Bot. 2: 242. 1864, Fl. Vit. 117. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 183. 1890; A. C. Sm. in Bishop Mus. Bull. 141: 116. 1936, in J. Arnold Arb. 33: 103. 1952; J. W. Parham, Pl. Fiji Isl. 86. 1964, ed. 2. 126. 1972; A. C. Sm. & Stone in J. Arnold Arb. 49: 474. pl. 8, fig. 1, 2. 1968.

FIGURE 156.

Slender tree 3-15 m. high, often conspicuous at elevations from near sea level to 1,050 m. in dense or thin forest or on its edges. The calyx and petals are white or green, often conspicuously purple-tinged; the stamens are white to pale yellow; the stylopodium is yellowish white and the stigmas are pale green; and the fruit turns black at maturity. Flowering and fruiting material is to be seen throughout the year.

TYPIFICATION: The type is *U. S. Expl. Exped.* (US 62359 HOLOTYPE; fragmentary ISOTYPE at GH), collected in 1840 on Ovalau at an elevation of 1,500 ft.

DISTRIBUTION: Endemic to Fiji and now known from eight of the high islands. Twenty-five collections have been examined.

LOCAL NAMES: Names ascribed to this most conspicuous Fijian species of *Plerandra* are *sole*, *sole ndina*, *sole ngua*, *sole kau*, *vola*, and *ndanindani*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Slopes of Mt. Nairosa, eastern flank of Mt. Evans Range, *Smith 4021*; vicinity of Nandarivatu, *Gillespie 3707*; Mt. Tomanivi, *DA 12702 (Melville et al. 7090)*. NANDRONGA & NAVOSA: Near Nakalavo, Singatoka Tikina, *H. B. R. Parham 232*. SERUA: Hills between Navua River and Wainiyavu Creek, near Namuamua, *Smith 8978*. RA: Mataimeravula, vicinity of Rewasa, near Vaileka, *Degener 15440*. NAITASIRI: Wainamo Creek, near Matawailevu, *St. John 18223*; vicinity of Tamavua, *Gillespie 2156*; vicinity of Kalambo, *DA 11242*; vicinity of Nasinu, *Gillespie 3432*. REWA: Namboro, *DA 5916*, p. p. KANDAVU: Mt. Mbuke Levu, *Smith 205*; vicinity of Lomati, *DA 14908*. KORO: Eastern slope of main ridge, *Smith 936*. NGAU: Hills east of Herald Bay, inland from Sawaieke, *Smith 7751*.



FIGURE 156. A branchlet of *Plerandra pickeringii* with foliage and an inflorescence, from Mathuata Province, Vanua Levu (Smith 6896), suggesting some of the problems faced by collectors in reducing araliaceous specimens to the size of herbarium sheets.

VANUA LEVU: MBUA: Southern portion of Seatovo Range, *Smith 1524*. MATHUATA: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, *Smith 6896*. THAKAUNDROVE: Maravu, near Salt Lake, *Degener & Ordonez 14274*. TAVEUNI: Western slope between Waiyevo and Wairiki, *Gillespie 4678*. MOALA: Near Naro, *Smith 1309*.

7. *Plerandra insolita* A. C. Sm. in J. Arnold Arb. 33: 103. 1952; J. W. Parham, Pl. Fiji Isl. 86. 1964, ed. 2. 126. 1972; A. C. Sm. & Stone in J. Arnold Arb. 49: 476. pl. 8, fig. 3-7. 1968. FIGURE 157.

Plerandra pickeringii sensu Seem. in Bonplandia 9: 256. 1861; A. Gray in op. cit. 10: 36. 1862, in Proc. Amer. Acad. Arts 5: 318. 1862; non A. Gray (1854).

Plerandra grayi sensu Seem. Viti, 437, p. p., non sensu typi. 1862.

Tree (1-) 5-11 (-20) m. high, slender, unbranched or sparingly branched, occurring in dense or open forest from near sea level to an elevation of about 1,200 m. The petals are pale to deep purple without and pale green or white within; the filaments are white to pale green, the anthers yellow; the disk or stylopodium is pale green; and the fruits become black at maturity. Specimens bearing both flowers and fruits have now been observed in most months.

TIPIFICATION: The type is *Smith 4922* (A HOLOTYPE; many ISOTYPES), collected June 26, 1947, on the southern slopes of Mt. Ndelainathovu, on the escarpment west of Nandarivatu, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji; although it was originally based on only three collections, the species has now been frequently obtained and is known from 26 collections, but thus far all are from Viti Levu.

LOCAL NAMES: *Sole, sole ngua, sole lailai*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, *Parks 20753*; Mt. Tomanivi, *DA 12763* (*Melville et al. 7155*). SERUA: Vicinity of Nambukelevu, upper Navua River, *DA L. 13667* (*Berry 96*); Mbuyombuyo, near Namboutini, *Tabualewa 15584*; inland from Korovisilou, *DF 411*; hills north of Ngaloa, in drainage of Wainingere Creek, *Smith 9166*. NAMOSI: Hills east of Wainikoroiluva River, near Namuama, *Smith 8912*; Nakavu, Navua River, *Parks 20384*. NAITASIRE: Wainisavulevu-Numbulolo divide, Taunaisali, on central plateau between Wainimala and Singatoka Rivers, *St. John 18325*; vicinity of Nanduna, near Waindrandra Creek, *DA 12593*; vicinity of Tamavua, *Gillespie 2465*. REWA: Namboro, *DA 5916*, p. p.; Mt. Korombamba, *DA 16511*. VITI LEVU without further locality, *Seemann 206* (July, 1860, and probably from the Serua coast).

4. SCHEFFLERA J. R. & G. Forst. Char. Gen. Pl. 23. 1775, ed. 2. 45. 1776; Seem. in J. Bot. 3: 175. 1865, Fl. Vit. 116. 1866; Harms in Engl. & Prantl, Nat. Pflanzenfam. III. 8: 35. 1894, in Bot. Jahrb. 56: 385. 1920; Hutchinson, Gen. Fl. Pl. 2: 69. 1967; A. C. Sm. & Stone in J. Arnold Arb. 49: 477. 1968. Nom. cons.

Unarmed trees or shrubs (or lianas), the indument various, sometimes composed of scalelike trichomes, sometimes stellate, the stipules connate within petiole bases and extending into a ligule; leaves digitately compound (as in our species) or rarely simple, the petiole expanded into a sheathing base, the leaflets petiolulate, the blades entire to serrate; inflorescences paniculate-racemose or compound-umbellate, with or without minute or obvious bracts and bracteoles, the pedicels long or short (or lacking), not articulate below flowers, the flowers ♂ or ♀, in stalked umbellules, capitula, racemes, or spicules, lacking conspicuous basal bracteoles; calyx limb small, 4-6-dentate or -lobed, often sinuate or obscure; petals 4-6, valvate, often connate and calyptrate; stamens 4-6 (rarely twice as many as petals but not in our species), the anthers oblong to ellipsoid, with loosely coherent locules; disk somewhat elevated at margin; ovary 4-12-locular (sterile in ♂ flowers), the styles free and radiating or connate or essentially none, then the stigmas subsessile on the conspicuous or inconspicuous stylopodium; fruits subglobose, often costate or sulcate, the exocarp fleshy, the pyrenes laterally compressed, crustaceous.

TYPE SPECIES: *Schefflera digitata* J. R. & G. Forst.



FIGURE 157. *Plerandra insolita*, from Serua Province, Viti Levu (Smith 9166); A, distal portion of branchlet, with foliage and a lateral infructescence, \times about 1/7; B, infructescence, \times about 1/2.

DISTRIBUTION: Pantropical and subtropical, its limits and subdivisions subject to diverse interpretations, the number of species perhaps 125–450 (depending upon breadth of the generic concept). An adequate division of this puzzling complex (or its acceptance as a variable but reasonably coherent generic taxon) must await a consensus of the opinions of present and future specialists. Four species are endemic in Fiji.

The first two of these belong in *Schefflera* in its most limited sense; the remaining two, with compound-umbellate inflorescences, may conceivably be assignable to another genus, if characters of inflorescence type should eventually be deemed of generic consequence.

KEY TO SPECIES

- Inflorescences paniculate-racemose, with 12-25 lateral branches 15-40 cm. long bearing numerous 5-10-flowered umbels racemously arranged; petals 1.2-1.7 mm. long; ovary locules and styles 5; fruits comparatively small, 4-6 mm. long and broad; leaflets (5-) 7-9, the blades usually 10-34 × 4-12.5 cm., with 8-18 secondary nerves per side.
- Indument (of young parts, some foliage parts, and inflorescence axes) composed of conspicuous, coarse, scalelike, many-celled hairs 2-10 mm. long; primary inflorescence bracts conspicuous, 15-40 mm. long, the umbel-subtending bracts 5-10 mm. long. 1. *S. euthytricha*
- Indument lacking or subsistent on lower leaflet blade surfaces and inflorescence axes, composed of close, scaly, minute hairs less than 0.2 mm. long; primary inflorescence bracts comparatively small, usually 3-8 mm. long, the umbel-subtending bracts not more than 5 mm. long. 2. *S. vitiensis*
- Inflorescences compound-umbellate, 1-3-times divided, with 3-10 primary rays, the ultimate umbels with 4-12 flowers; petals 4-5 mm. long (not known for species no. 3); ovary locules and styles 5-12; fruits comparatively large, 8-13 mm. long and broad; leaflets (2-) 4-9, the blades usually 6-17 × 2.5-8 cm., with 20-40 secondary nerves per side; plants glabrous throughout.
- Leaves with a conspicuous petiolar ligule free in the distal 3-6 cm.; leaflets with petiolules 2-4.5 cm. long, the blades usually 7-14 × 2.5-6.5 cm., acuminate at apex (acumen 5-20 mm. long); fruits with 8-12 costae and locules, the stylopodium broadly conical, with a stout, conical styler column about 1.5 mm. long and 1-1.5 mm. in subapical diameter. 3. *S. costata*
- Leaves with a petiolar ligule free in the distal 1 cm. or less; leaflets with petiolules 1-3.5 cm. long, the blades usually 6-17 × 3.5-8 cm., rounded to obtusely short-acuminate at apex; fruits with 5-7 costae and locules, the stylopodium conical, with a slender styler column about 2 mm. long and 0.5-1 mm. in subapical diameter. 4. *S. seemanniana*

1. *Schefflera euthytricha* A. C. Sm. in Contr. U. S. Nat. Herb. 37:86. 1967; A. C. Sm. & Stone in J. Arnold Arb. 49:479. pl. 6. 1968; J. W. Parham, Pl. Fiji Isl. ed. 2. 129. 1972. FIGURE 155D.

Slender tree 3-6 m. high, infrequent in dense or secondary forest at elevations of 50-200 m. The conspicuous inflorescence indument is dull brown; the calyx, petals, and filaments are greenish white; and the fruit is black. Flowers were obtained in October and fruits in May; the latter are similar to those of *Schefflera vitiensis* and are known from the Vanua Levu collection cited below.

TYPIFICATION: The type is *Smith 8908* (US 2191526 & 2191527 HOLOTYPE; many ISOTYPES), collected Oct. 15, 1953, in hills east of the Wainikoroiluva River near Namuamua, Namosi Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and known from only three collections from the two largest islands.

LOCAL NAME: *Sole tangane*.

AVAILABLE COLLECTIONS: VITI LEVU: SERUA: Hills between Navua River and Wainiyavu Creek, near Namuamua, *Smith 8983*. VANUA LEVU: THAKAUNDROVE: Track to Natewa, Natewa Peninsula, *DA 15078*.

2. *Schefflera vitiensis* (A. Gray) Seem. in J. Bot. 3:176. 1865, Fl. Vit. 116. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 182. 1890; Harms in Engl. & Prantl, Nat. Pflanzenfam. III. 8:39. 1894; Gibbs in J. Linn. Soc. Bot. 39:148. 1909; J. W. Parham, Pl. Fiji Isl. 86. 1964, ed. 2. 130. 1972; A. C. Sm. & Stone in J. Arnold Arb. 49:483. pl. 4, fig. 1, 2. 1968.

Aralia vitiensis A. Gray, Bot. U. S. Expl. Exped. 1:715. 1854, Atlas, pl. 89. 1856; Seem. in Bonplandia 9:256. 1861, Viti, 437. 1862; A. Gray in Bonplandia 10:36. 1862.

Tree 2-18 m. high, variously noted as slender, freely branched, or gnarled, sometimes with a trunk to 20 cm. in diameter, locally abundant at elevations from near

sea level to 1,130 m. in dense or open forest or in crest thickets. The peduncles, pedicels, and calyx are dull to rich purple, the petals and filaments pale green to yellow, the anthers nearly white, and the fruits dull purple turning to black. Flowering and fruiting individuals are to be found throughout the year.

TIPIFICATION: *Aralia vitiensis* was based on *U. S. Expl. Exped.* (US 47685 HOLOTYPE), collected in 1840 on Ovalau.

DISTRIBUTION: This most abundant Fijian species of *Schefflera*, although endemic, is now known from seven islands and more than 80 collections.

LOCAL NAMES: In addition to the usual name *sole*, this species has been recorded as *sole lewa* (Serua), *sangole* (Nandronga & Navosa), *sole ngga* (Tailevu), *ndaindainga* (Ovalau), *ndanindani* (Mbua), and *kai i voli* and *kaikai* (Thakaundrove).

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mt. Evans Range, *Greenwood* 377; Mt. Yoo, west of Nandarivatu, *Webster & Hildreth* 14139; Nandarivatu, *Gibbs* 580; Mt. Tomanivi, *DA* 12698 (*Melville et al.* 7086). NANDRONGA & NAVOSA: Northern portion of Rairaimatuku Plateau, between Nandrau and Nanga, *Smith* 5508; north of Komave, *St. John* 18966. SERUA: Upper Navua River, *DA* 15511; vicinity of Ngaloa, *Degener* 15147. NAMOSI: Mt. Naitarandamu, *Gillespie* 3137; Mt. Voma, *DA* 11660; Mt. Vakarongasi, *DA* 14595. RA: Vicinity of Rewasa, near Vaileka, *Degener* 15510. NAITASIRI: Wainisavulevu Creek, Rarandawai to Nairairaikinasavu, *St. John* 18286; Tamavua, *Yeoward* 87. TAILEVU: Vicinity of Naivithula, Wainivesi River, *DA* 13237. REWA: Mt. Korombamba, *Meebold* 16554. KANDAVU: Mt. Mbuke Levu, *Smith* 264. OVALAU: Summit of Mt. Ndelaiovalau and adjacent ridge, *Smith* 7372; hills above Levuka, *Gillespie* 4435. NGAU: Hills east of Herald Bay, inland from Sawaieka, *Smith* 7791. VANUA LEVU: MBUA: Southern portion of Seatovo Range, *Smith* 1562. THAKAUNDROVE: Southern slope of Korotini Range, below Navitho Pass, *Smith* 513. TAVEUNI: Somosomo, *Seemann* 203; summit and adjacent slopes of Mt. Manuka, east of Wairiki, *Smith* 8237. YATHATA: Navakathuru, *DA* 16304.

3. *Schefflera costata* A. C. Sm. in *Bishop Mus. Bull.* **141**: 119. *fig.* 62. 1936; J. W. Parham, *Pl. Fiji Isl.* 86. 1964, ed. 2. 129. 1972; A. C. Sm. & Stone in *J. Arnold Arb.* **49**: 487. *pl.* 4, *fig.* 8. 1968.

An apparently rare tree about 5 m. high, found in dense forest at elevations of 600–900 m. (or probably higher, but no elevation given for the more recent of the two known collections). Both specimens were obtained in fruit in December.

TIPIFICATION: The type is *Smith* 886 (BISH HOLOTYPE; many ISOTYPES), collected Dec. 29, 1933, on the western slopes of Taveuni between Somosomo and Wairiki.

DISTRIBUTION: Endemic to Fiji and known only from middle or high elevations on Viti Levu and Taveuni.

AVAILABLE COLLECTION: VITI LEVU: MBA: Mt. Tomanivi, *O. & I. Degener* 32062 (Dec. 29, 1968).

On the basis of the second collection a slight amplification of earlier descriptions may be given: Free portion of ligule to 6 cm. long; petiolules to 4.5 cm. long; leaflet blades to 14 cm. long, sometimes obtuse at base and with as many as 40 secondary nerves per side; peduncle of infructescence 4–6 cm. long, the primary rays 7–10, with peduncles to 6.5 cm. long; fruits in ultimate clusters of 2–6; the pedicels to 10 mm. long.

4. *Schefflera seemanniana* A. C. Sm. in *Bishop Mus. Bull.* **141**: 118. 1936; J. W. Parham, *Pl. Fiji Isl.* 86. 1964, ed. 2. 129. 1972; A. C. Sm. & Stone in *J. Arnold Arb.* **49**: 487. *pl.* 4, *fig.* 9, 10. 1968.

Agalma vitiensis Seem. *Fl. Vit.* 116. 1866; Anon. in *Gartenfl.* **36**: 71, as *Agalina* v. 1887, in *Kew Bull.* **1888**: 91. 1888; non *Schefflera vitiensis* Seem.

Heptaleurum vitiense Seem. ex Drake, *Ill. Fl. Ins. Mar. Pac.* **183**. 1890; Benth. & Hook. f. ex Drake, *op. cit.* **409**. 1892; *Gillespie* in *Bishop Mus. Bull.* **91**: 24. *fig.* 27. 1932.

A slender or freely branching tree 3–25 m. high, with a trunk up to 70 cm. in diameter, occurring in dense forest and crest thickets at elevations of 150–900 m. The calyx, petals, filaments, and gynoeceum are bright green to yellow, and the fruits become black at maturity. Flowers have been noted between May and October, fruits between June and November and also in February and March.

TYPEFICTION: The type of *Agalma vitiensis*, for which *Schefflera seemanniana* was a new name, is *Graeffe 38* (MEL HOLOTYPE; ISOTYPE at BM; photo of ISOTYPE at US), collected on Viti Levu without further locality, presumably in 1862 or 1864.

DISTRIBUTION: Endemic to Viti Levu and now known from five of the high islands.

LOCAL NAME: *Sole*.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mt. Nandende Levu, *DA 14058*. NANDRONGA & NAVOSA: Nausori Highlands, *DF 216*, *Watkins 781*. SERUA: Inland from Navutulevu, *Howard 47*; inland from Namboutini, *DF 414*, *Damanu 86*. NAMOSI: Hills north of Wainavindrau Creek, between Korombasambasanga Range and Mt. Naitarandamu, *Smith 8480*; hills bordering Wainavindrau Creek, vicinity of Wainimakutu, *Smith 8543*; Mt. Voma, *Gillespie 2668*, *DA 1717*; Mt. Vakarongasiu, *DA 16137*. NAITASIRI: Central road, *Tothill 220*. REWA: Mt. Korombamba, *Gillespie 2357*. KANDAVU: Mt. Mbuke Levu, *Smith 242*. OVALAU: *U. S. Expl. Exped. (us 73841)*; summit of Mt. Tana Lailai and adjacent ridge, *Smith 7703*. NGAU: Hills east of Herald Bay, inland from Sawaieke, *Smith 7852*. VANUA LEVU: THAKAUNDRIVE: Navonu Creek, Natewa Peninsula, *DA 15092*, *Howard 106*. FIJI without further locality, *DA L.13257*.

Gray (Bot. U. S. Expl. Exped. 1: 723. 1854) noted that the specimen from Ovalau (US 73841, cited above) probably represented an undescribed species of *Paratropia*.

5. *BRASSAIA* Endl. Nov. Stirp. Dec. 89. 1839; Hutchinson, Gen. Fl. Pl. 2: 73, p. p. 1967; A. C. Sm. & Stone in J. Arnold Arb. 49: 489. 1968.

Schefflera sect. *Brassaia* C.-j. Tseng & Hoo in Acta Phytotax Sin., Addit. 1: 133, quoad basionymum. 1965; Frodin in J. Arnold Arb. 56: 435. 1975.

A genus closely resembling the capituliferous species of *Schefflera* (sens. lat.) in most respects; leaves long-petiolate, digitately compound; inflorescences paniculate, with radiating branches bearing capitula, the flowers each subtended by 4 large, winglike, imbricate basal bracteoles; ovary 8–30-locular.

TYPE SPECIES: *Brassaia actinophylla* Endl.

DISTRIBUTION: Aru Islands and New Guinea to the Solomon and Caroline Islands and Australia, with about 15 species (Frodin, 1975, as *Schefflera* sect.). One species is widely cultivated and naturalized in other tropical areas.

It is very likely that future students of the Araliaceae will agree with Frodin (1975) that *Brassaia* merits only sectional recognition within an extended concept of *Schefflera*; in that case the correct name for our species is *S. actinophylla* (Endl.) Harms.

1. *Brassaia actinophylla* Endl. Nov. Stirp. Dec. 89. 1839; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 97. 1948, in op. cit. 29: 31. 1959, Pl. Fiji Isl. 83. 1964, ed. 2. 126. 1972; A. C. Sm. & Stone in J. Arnold Arb. 49: 490. 1968; Fosberg in *Baileya* 19: 46. 1973.

Schefflera actinophylla Harms in Engl. & Prantl, Nat. Pflanzenfam. III. 8: 36. 1894; Frodin in J. Arnold Arb. 56: 436. 1975.

Tree 10–15 m. (or more) in height, cultivated and also naturalized in secondary forest at low elevation. It is strikingly ornamental, with long petioles and large, radiating leaflets with coriaceous blades; inflorescences purplish, consisting of several stout, stiff, spreading branches 40–80 cm. long; heads numerous, on short peduncles 5–15 mm. long, the flowers usually 8–12 per head; fruits subglobose, multicostate, black at maturity, the stigmas sessile in a ring surmounting the truncate stylopodium. Flowers and fruits seem most obvious between December and March.

TYPEFICTION: Based on material from Queensland, Australia.

DISTRIBUTION: Northern Australia, Aru Islands, and New Guinea; widely cultivated and often naturalized in other tropical and subtropical areas.

LOCAL NAMES AND USE: *Umbrella tree*, *Queensland umbrella tree*, *octopus tree*; a commonly cultivated ornamental along streets and in gardens, now becoming widely naturalized in southeastern Viti Levu.

AVAILABLE COLLECTIONS: VITI LEVU: NAMOSI: Wainandoi River, *DF 495 (Damanu 134)*. NAITASIRE: Vicinity of Nasinu, *DA 11241*. REWA: Suva, in private garden, *DA 16772*; reported by Parham as growing in the Suva Botanical Gardens, but no specimen available.

FAMILY 145. APIACEAE

APIACEAE Lindl. *Nat. Syst. Bot.* ed. 2. 21. 1836.

Umbelliferae Juss. *Gen. Pl.* 218. 1789. *Nom. alt.*

Annual or perennial herbs, acaulescent or caulescent, rarely suffrutescent or shrubby, usually estipulate; leaves alternate (rarely opposite) or basal, simple or compound, the petioles usually sheathing, the blades often deeply incised or divided; inflorescences simple or compound umbels, the umbels sometimes proliferous or capitate, the rays sometimes subtended by bracts forming an involucre, the umbellules usually subtended by bracteoles forming an involucre; flowers small, actinomorphic (or occasionally radiant), usually ♂ and protandrous; calyx tube adnate to ovary, the lobes small or obsolete; petals 5, valvate or slightly imbricate, usually inflexed at apex; disk epigynous; stamens 5, inserted on disk, alternate with petals, the filaments filiform, the anthers often versatile, dehiscing lengthwise; ovary inferior, 2-locular, the ovules solitary in each locule, pendulous, anatropous, epitropous (with ventral raphe), the styles 2, sometimes swollen proximally and forming a stylopodium, the stigmas inconspicuous, papillate; fruit a schizocarp composed of 2 commissural mericarps, terete or variously compressed, each mericarp with 5 primary ribs and sometimes with secondary ribs, these filiform to winged, thin or corky, the mericarps with oil tubes (vittae) present or obsolete between or under ribs and on commissure, splitting apart at maturity and usually suspended from a slender, central carpophore; seeds pendulous, the embryo small, the endosperm cartilaginous.

DISTRIBUTION: Cosmopolitan, principally North Temperate, with about 300 genera and 3,000 species. The family includes many edible plants, spices, etc. Eight genera are recorded from Fiji, each with a single species, of which only two are indigenous.

USEFUL TREATMENTS OF FAMILY: MATHIAS, M. E., & L. CONSTANCE. *Umbelliferae*. *N. Amer. Fl.* **28B**: 43-160. 1944; 161-295. 1945. BUWALDA, P. *Umbelliferae*. *Fl. Males.* 1. **4**: 113-140. 1949. BACKER, C. A., & R. C. BAKHUIZEN VAN DEN BRINK, JR. *Apiaceae*. *Fl. Java* **2**: 171-178. 1965. KRAHULIK, J. L., & W. L. THEOBALD. *Umbelliferae*. *In: Dassanayake, M. D., & F. R. Fosberg, Rev. Handb. Fl. Ceylon* **3**: 479-499. 1981.

In addition to the species discussed below, the *parsnip* (*Pastinaca sativa* L.) and *celery* (*Apium graveolens* L.) are reported as sparingly cultivated in Tonga or on Niue (Yuncker in *Bishop Mus. Bull.* **178**: 93. 1943, in op. cit. **220**: 209. 1959; Sykes in *New Zealand Dept. Sci. Indust. Res. Bull.* **200**: 209. 1970). There are no records of these garden plants from Fiji but either or both may be anticipated in cultivation.

KEY TO GENERA

- Prostrate herbs, rooting at nodes; flowers in simple umbels; fruit strongly flattened laterally.
 Leaf blades crenate or lobed; petioles not sheathing; stipules present; involucre bracts minute or absent; petals valvate; stylopodium present; fruit without evident secondary ribs or reticulations; carpophore absent. 1. *Hydrocotyle*
 Leaf blades entire to repand-dentate; petioles sheathing at base; stipules lacking; involucre bracts conspicuous; petals imbricate in bud; stylopodium obsolete; fruit with evident secondary ribs and reticulations; carpophore present. 2. *Centella*
 Slender to stout herbs, erect or ascending; flowers in heads or simple or compound umbels; fruit terete, flattened dorsally or slightly (but never strongly) flattened laterally.
 Leaf blades and involucre bracts prominently spinescent; inflorescence capitate, the heads often in dichasia. 3. *Eryngium*
 Leaf blades and involucre bracts not spinescent; basic unit of inflorescence a compound (appearing simple) or regularly compound umbel.
 Ovary and fruit armed with uncinat prickles or glochidiate spines; leaves pinnately decomposed, the ultimate divisions linear; flowers in regularly compound umbels; carpophore present.

Ovary and fruit unarmed, glabrous or variously pubescent.

Leaves heteromorphic, the blades of cauline leaves more finely divided than those of basal leaves; calyx lobes large, conspicuous; oil tubes obscure. 5. *Coriandrum*

Leaves similar throughout; calyx lobes minute or lacking; oil tubes conspicuous.

Petals white or greenish; ultimate divisions of leaf blades filiform or linear, in our species 2-10 × 0.5-1 mm. 6. *Apium*

Petals yellow or greenish yellow.

Ultimate divisions of leaf blades filiform, in our species to 30-40 × about 5 mm.; involucre and involucre lacking. 7. *Foeniculum*

Ultimate divisions of leaf blades ovate to linear, dentate or lobed, in our species 25-50 × 15-40 mm.; involucre of inconspicuous bracts or lacking; involucre of several linear bracteoles shorter than flowers. 8. *Petroselinum*

1. *Hydrocotyle* L. Sp. Pl. 234. 1753; Mathias & Constance in N. Amer. Fl. **28B**: 51. 1944; Buwalda in Fl. Males. I. **4**: 115. 1949; Backer & Bakh. f. Fl. Java **2**: 172. 1965; Krauhlik & Theob. in Rev. Handb. Fl. Ceylon **3**: 481. 1981.

Slender perennial herbs, with creeping stems or rootstocks rooting at nodes, stipulate; leaves alternate, simple, the petioles not sheathing, the blades nonpeltate (as in our species) or peltate, lobed or crenate, palmately veined; inflorescence usually a simple umbel, the peduncles axillary, solitary or clustered, the involucre inconspicuous or absent; flowers subsessile or pedicellate, the calyx lobes minute or lacking, the petals valvate, ovate, white to greenish, the styles usually longer than the conical to depressed stylopodium; fruits orbicular to ellipsoid, strongly flattened laterally (at right angles to the narrow commissure), the mericarps dorsally rounded or acute, without obvious secondary ribs or reticulations, the carpophore absent.

LECTOTYPE SPECIES: *Hydrocotyle vulgaris* L. (vide Hitchcock, Prop. Brit. Bot. 138. 1929).

DISTRIBUTION: Pantropical, extending into temperate areas, especially austral, with about 100 species.

1. *Hydrocotyle javanica* Thunb. Diss. Hydrocot. 3, 6. t. 2. 1798; A. C. Sm. in Sargentia **1**: 96. 1942; Buwalda in Fl. Males. I. **4**: 115. 1949; J. W. Parham in Dept. Agr. Fiji Bull. **35**: 99. 1959, Pl. Fiji Isl. 231. 1964, ed. 2. 320. 1972; Backer & Bakh. f. Fl. Java **2**: 172. 1965; Krauhlik & Theob. in Rev. Handb. Fl. Ceylon **3**: 481. 1981.

A succulent herb forming a locally abundant ground cover in dense forest at elevations of 300-600 m., the erect portions 15-45 cm. high; petioles ascending, usually 4-25 cm. long, the leaf blades orbicular-reniform, up to 5 × 8 cm., deeply cordate at base, shallowly palmately lobed, each lobe with a coarsely crenate margin; inflorescences shorter than leaves, 1-several at nodes, the umbels small, congested, many-flowered, the petals and filaments greenish white; fruit reddish brown, about 1 mm. long. Flowers have been noted in December, January, and May, fruits only in May and August.

TYPIFICATION: No information was given by Thunberg.

DISTRIBUTION: Eastern and southeastern Asia and tropical Africa, eastward in the Pacific through Malesia to Australia and the Solomon Islands, with a small outlying population in Fiji. Although the species was listed by Parham (1959) as a weed, in my observation it seems indigenous and curiously may be limited to a single island in Fiji, Taveuni, where it is locally abundant in dense forest. The specimen cited by Parham is *DA 7020* (from near Naitauvoli, on Waingga Creek, a Wainimala River tributary in Naitasiri Province, Viti Levu), but the specimen has not been seen by me; if correctly identified it would seem to be the only record from Viti Levu.

AVAILABLE COLLECTIONS: TAVEUNI: Western slope between Somosomo and Wairiki, *Smith 915*; slopes of Mt. Manuka, east of Wairiki, *Smith 8351*; above Ngathavula Estate, *DA 16905*; track to Mt. Uluingalau, *DA 14079*.

2. *CENTELLA* L. Sp. Pl. ed. 2. 1393. 1763; Mathias & Constance in N. Amer. Fl. **28B**: 58. 1944; Buwalda in Fl. Males. I. **4**: 116. 1949; Backer & Bakh. f. Fl. Java **2**: 173. 1965; Krauhlik & Theob. in Rev. Handb. Fl. Ceylon **3**: 483. 1981.

Slender, prostrate, perennial herbs, the stems creeping, rooting at nodes, estipulate; leaves alternate, simple, the petioles sheathing at base, the blades membranaceous, orbicular to reniform, palmately veined, entire to repand-dentate; inflorescence of loose to subcapitate, simple umbels, the peduncles axillary, the involucrel bracts 2 or 3, ovate, conspicuous; flowers subsessile or short-pedicellate, the calyx lobes obscure or lacking; petals imbricate in bud, suborbicular to ovate, white to reddish, the styles short, the stylopodium obsolete; fruits orbicular to ellipsoid, strongly flattened laterally (at right angles to the narrow commissure), the mericarps with prominent primary ribs and conspicuous, filiform secondary ribs connected by conspicuous reticulations, the carpophore entire.

LECTOTYPE SPECIES: *Centella villosa* L. (vide Britton & Brown, Ill. Fl. N. U. S. ed. 2. **2**: 651. 1913).

DISTRIBUTION: Mostly in southern Africa, with about 20 species, but with the *Centella asiatica* complex circumtropical and extending to New Zealand, Chile, and the southeastern U. S.

1. *Centella asiatica* (L.) Urb. in Mart. Fl. Bras. **11** (1): 287. *t.* 78, *fig.* 1. 1879; Christophersen in Bishop Mus. Bull. **128**: 165. 1935; Yuncker in op. cit. **178**: 92. 1943, in op. cit. **184**: 56. 1945; Buwalda in Fl. Males. I. **4**: 117. 1949; Yuncker in Bishop Mus. Bull. **220**: 208. 1959; Backer & Bakh. f. Fl. Java **2**: 173. 1965; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 208. 1970; J. W. Parham, Pl. Fiji Isl. ed. 2. 320. 1972; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 129. 1972; Krauhlik & Theob. in Rev. Handb. Fl. Ceylon **3**: 484. 1981.

Hydrocotyle asiatica L. Sp. Pl. 234. 1753; A. Gray, Bot. U. S. Expl. Exped. **1**: 693. 1854; Seem. in Bonplandia **9**: 256. 1861, Viti, 437. 1862, Fl. Vit. 113. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 179. 1890; Gibbs in J. Linn. Soc. Bot. **39**: 148. 1909; Greenwood in Proc. Linn. Soc. **154**: 99. 1943; J. W. Parham in Dept. Agr. Fiji Bull. **35**: 99. *fig.* 48. 1959, Pl. Fiji Isl. 231. 1964.

A perennial herb found from near sea level to about 800 m. in open places and on fern-covered ridges, and also along roadsides in shade, in cultivated land, and in pastures; erect portions 15–40 cm. high, the leaves clustered at each node, the petioles variable, usually 3–20 cm. long, the leaf blades to 4 × 5 cm. or sometimes larger, broadly cordate at base, regularly repand-dentate at margin; umbels few-flowered, on peduncles less than 5 cm. long, the involucrel bracts conspicuous, to 3 mm. long, the pedicels less than 4 mm. long; petals minute, white to reddish purple; fruit orbicular to ellipsoid, up to 5 mm. in diameter, yellowish brown.

TYPIIFICATION: Several prior references were listed by Linnaeus, with the note "*Habitat in India.*"

DISTRIBUTION: Pantropical and subtropical, in the New World from the southeastern U. S. to southern Chile. Although it is locally considered a weed (Parham, 1959), it is presumably indigenous, having been collected in 1840 by the Exploring Expedition and often found in natural, if not forested, habitats.

LOCAL NAMES AND USES: *Totondro* (also *toto*, *tatandra*) is the best known Fijian name for what is sometimes called *pennywort*. The leaves and young stems are reputed to have various medicinal uses in treating stomach ailments, diarrhoea, neuralgia, and "pains in the ribs."

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Hills near Lautoka, Greenwood 408, 1209; vicinity of Nandarivatu, Gibbs 810. NAMOSI: Between Namuamua and Namosi, Weiner 5. RA: Vicinity of Nasukamai, Gillespie 4692.2. NAITASIRI: Vunindawa, DA 10041; Nanduruloulou, DA 714, 9580; Koronivia, DA 10850.

REWA: Ndelaivasi, *DA 11257*; vicinity of Suva, *Degener & Ordonez 13503, DA 3678, 6090*. KANDAVU: Without further locality, *DA 2456*. OVALAU: *U. S. Expl. Exped.* (us 73842). VANUA LEVU: MBUA: Rukuruku Bay, *H. B. R. Parham s. n.* MOALA: *Bryan 316f*. VANUA MBALAVU: Near Lomaloma, *Garnock-Jones 1098*. LAKEMBA: Naivanavana Valley, *Garnock-Jones 926*. FIJI without further locality, *Seemann [202], Gillespie 4394A*.

3. *ERYNGIUM* L. Sp. Pl. 232. 1753; Wolff in *Pflanzenr.* 61 (IV. 228): 106. 1913; Mathias & Constance in *N. Amer. Fl.* 28B: 261. 1945; Buwalda in *Fl. Males. I.* 4: 126. 1949; Backer & Bakh. f. *Fl. Java* 2: 173. 1965; Krauhlik & Theob. in *Rev. Handb. Fl. Ceylon* 3: 486. 1981.

Biennial or perennial herbs, usually erect from taproots or rootstocks, usually spinose and glabrous, stipulate; leaves in a basal rosette or the upper ones alternate, the petioles sheathing at base or throughout, sometimes septate, the blades coriaceous to membranaceous, simple, entire to pinnately or palmately lobed to divided, often ciliate or spinose; inflorescences capitate, the heads solitary or in dichasia (as in our species) or cymes or racemes, the involucre bracts linear or lanceolate to ovate, spinescent, subtending the head or dichasium; flowers sessile, subtended by an involucre of bracteoles, these entire or lobed; calyx lobes conspicuous, ovate to lanceolate, persistent; petals white to purple, the apices inflexed, lobed to fimbriate; styles sometimes exceeding calyx lobes, the stylopodium lacking; fruit globose to obovoid, scarcely compressed laterally, the mericarps rounded or flattened dorsally, often covered by scales, tubercles, or papillae, the commissure broad, the carpophore lacking.

LECTOTYPE SPECIES: *Eryngium maritimum* L. (vide Hitchcock, *Prop. Brit. Bot.* 138. 1929).

DISTRIBUTION: Cosmopolitan, with about 230 species, but absent from tropical and southern Africa.

1. *Eryngium foetidum* L. Sp. Pl. 232. 1753; Wolff in *Pflanzenr.* 61 (IV. 228): 203. 1913; Greenwood in *Proc. Linn. Soc.* 154: 94. 1943; Mathias & Constance in *N. Amer. Fl.* 28B: 280. 1945; Buwalda in *Fl. Males. I.* 4: 126. *fig. 5*. 1949; J. W. Parham in *Dept. Agr. Fiji Bull.* 35: 100. *fig. 49*. 1959, *Pl. Fiji Isl.* 231. 1964, ed. 2. 320. 1972; Backer & Bakh. f. *Fl. Java* 2: 174. 1965; Krauhlik & Theob. in *Rev. Handb. Fl. Ceylon* 3: 487. 1981.

A coarse, biennial herb 15–45 cm. high, sometimes locally abundant near sea level as a naturalized weed in waste places, cultivated areas, and along roadsides; leaves rosulate and cauline, the blades lanceolate to oblanceolate, up to 30 × 5 cm., crenate to spinulose-serrate; inflorescence heads numerous, cylindric, about 10 × 5 mm., the involucre bracts lanceolate, exceeding the heads, commonly 2–3 cm. long; petals white or greenish; fruits greenish, subglobose, about 1.5 mm. in diameter. Flowers and fruits seem to occur at any time.

TYPIFICATION: Several earlier references were listed by Linnaeus.

DISTRIBUTION: Indigenous in tropical America, introduced into some parts of tropical Africa and Asia, including Malesia and some Pacific groups. It was first observed in Fiji in 1923 (*Turbet 32*, cited below), but whether it was introduced for its edible qualities is unclear; at any rate it is now considered a troublesome weed because of the spiny leaves.

USES: In other areas parts of the plant are eaten with rice, either raw or steamed, and used as a condiment. In Fiji it is occasionally used in curries.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Waindravo Creek, near Vunindawa, *DA 9918*. TAILEVU: Sach's farm, *DA 3447*. REWA: Suva, *C. R. Turbet 32* (κ), Oct., 1923, *Greenwood 757, DA 12269*. VANUA LEVU: MATHUATA: Tambia, *DA 10494*; Lambasa, *DA 13693*. FIJI without further locality, *DA 3450, L.966*.

4. *DAUCUS* L. Sp. Pl. 242. 1753; Mathias & Constance in N. Amer. Fl. **28B**: 112. 1944; Backer & Bakh. f. Fl. Java **2**: 178. 1965; Krauhlik & Theob. in Rev. Handb. Fl. Ceylon **3**: 488. 1981.

Herbaceous, erect, caulescent annuals or biennials, with taproots, the stems branching; leaves alternate, the petioles sheathing, the blades 2- or 3-times pinnately decompound, the ultimate divisions small, narrow, linear; inflorescence a regularly compound umbel, the rays few to numerous, incurved after anthesis, the involucrel bracts foliaceous, equalling or exceeding rays, pinnately decompound, sometimes lacking, the involucrel bracteoles linear, subequal to pedicels, sometimes lacking, the pedicels spreading, unequal; calyx lobes minute or lacking; petals white (or those of central flowers purplish or yellowish), the outer ones often radiant; styles short, the stylopodium conical; fruits oblong to ovoid, somewhat compressed dorsally (parallel to commissure), the mericarps with primary ribs slender, bristly, the secondary ribs winged, the wings with a single row of prominent, barbed or glochidiate prickles, the carpophore entire or bifid.

LECTOTYPE SPECIES: *Daucus carota* L. (vide Hitchcock, Prop. Brit. Bot. 139. 1929).

DISTRIBUTION: Widely distributed but concentrated in the Mediterranean region, with 25-60 species.

1. *Daucus carota* L. Sp. Pl. 242. 1753; Mathias & Constance in N. Amer. Fl. **28B**: 113. 1944; Buwalda in Fl. Males. I. **4**: 140. 1949; J. W. Parham, Pl. Fiji Isl. 231. 1964, ed. 2. 320. 1972; Backer & Bakh. f. Fl. Java **2**: 178. 1965; Krauhlik & Theob. in Rev. Handb. Fl. Ceylon **3**: 488. 1981.

Although no herbarium records are available, the common garden carrot has been introduced and is grown in home and market gardens in Fiji.

TYPIFICATION: Linnaeus listed several prior references.

DISTRIBUTION: Indigenous in Europe, northern Africa, and temperate Asia; cultivated elsewhere and sometimes naturalized.

LOCAL NAME AND USE: The taproot of the cultivated *carrot* is edible cooked or raw.

The edible carrot, derived from subsp. *carota*, is referable to subsp. *sativus* (Hoffm.) Thell. (cf. Purseglove, Trop. Crops, Dicot. 651, fig. 102. 1968); it is listed as a subspecies or variety in Tonga and Niue by Yuncker in Bishop Mus. Bull. **178**: 93. 1943, in op. cit. **220**: 209. 1959, and by Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 208. 1970.

5. *CORIANDRUM* L. Sp. Pl. 256. 1753; Mathias & Constance in N. Amer. Fl. **28B**: 150. 1944; Backer & Bakh. f. Fl. Java **2**: 174. 1965; Krauhlik & Theob. in Rev. Handb. Fl. Ceylon **3**: 489. 1981.

Herbaceous, caulescent, slender, erect, glabrous annuals, with slender taproots, the stems branching; leaves alternate, heteromorphic, the petioles sheathing, the blades trifoliolate to ternately or pinnately decompound, the leaflets of basal leaves ovate, incised, those of cauline leaves with linear ultimate divisions; inflorescence a loose, regularly compound umbel, the peduncles terminal and lateral, sympodial, the involucrel bracts usually lacking, the rays few, the pedicels spreading, the involucrel bracteoles few, filiform, inconspicuous; calyx lobes prominent, often unequal; petals white to rose-colored, conspicuously unequal, the outer ones usually radiant; styles spreading, slender, the stylopodium conical; fruit orbicular, subterete, the mericarps not readily separating at maturity, the ribs filiform to obscure, the oil tubes obscure, the carpophore 2-parted.

LECTOTYPE SPECIES: *Coriandrum sativum* L. (vide Hitchcock, Prop. Brit. Bot. 141. 1929).

DISTRIBUTION: Mediterranean region, composed of one or two species.

1. *Coriandrum sativum* L. Sp. Pl. 256. 1753; Greenwood in Proc. Linn. Soc. **154**: 99. 1943; Mathias & Constance in N. Amer. Fl. **28B**: 150. 1944; Buwalda in Fl. Males. I. **4**: 128. 1949; J. W. Parham, Pl. Fiji Isl. 230. 1964, ed. 2. 320. 1972; Backer & Bakh. f. Fl. Java **2**: 174. 1965; Pursglove, Trop. Crops, Dicot. 650. 1968; Kraulik & Theob. in Rev. Handb. Fl. Ceylon **3**: 489. 1981.

A coarse herb 15–80 cm. high, cultivated on a small scale near sea level and also naturalized on sandy soil and as a weed in canefields and agricultural land; basal leaves trifoliolate, with leaflet blades ovate, 1–2.5 cm. long and broad, incised at margin; cauline leaves biternately decomposed, the ultimate segments linear, 3–10 × 0.5–1.5 mm.; inflorescence rays few, to 2.5 cm. long; petals white or rose-tinged; fruits suborbicular, 3–5 mm. in diameter. Flowers and fruits have been noted between July and October.

TYPIFICATION: Several earlier references were cited by Linnaeus.

DISTRIBUTION: Mediterranean region to central Asia, widely cultivated and adventive elsewhere. Apparently it was first noted in Fiji by Greenwood in 1920, at which time it was already common in the area of Singatoka.

LOCAL NAMES AND USES: *Coriander*; *dhania* (Hindi). The young plants are used in chutneys, sauces, etc., and the dried fruits are used as a spice and seasoning, being an ingredient of curry powder. The fruits contain a volatile oil used for flavoring and in medicine.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Near Ndreketi Inlet, Vunda Point, DA 10322. NANDRONGA & NAVOSA: Thuvu, west of Singatoka, Greenwood 70 (K), Sept. 14, 1920. RA: Waimare, DA 9535. TAILEVU: Vuthi road, Raralevu, DA 10601. VANUA LEVU: MATHUATA: Ndaku, DA 11480.

6. *APIUM* L. Sp. Pl. 264. 1753; Wolff in Pflanzenr. **90** (IV. 228): 26. 1927; Mathias & Constance in N. Amer. Fl. **28B**: 129. 1944; Backer & Bakh. f. Fl. Java **2**: 175. 1965; Kraulik & Theob. in Rev. Handb. Fl. Ceylon **3**: 491. 1981.

Cauliscent, glabrous, annual, biennial, or perennial herbs, with taproots or creeping rootstocks, the stems usually branching; leaves alternate, the petioles sheathing at base, the blades membranaceous, pinnate to ternately or pinnately decomposed, the ultimate divisions in our species filiform or linear; inflorescence of lax, compound (rarely simple) umbels, the peduncles terminal and lateral, the umbels sometimes sessile, the involucrel bracts and involucrel bracteoles small or absent, the rays few; calyx lobes minute or lacking; petals ovate to suborbicular, white or greenish; styles short, spreading, the stylopodium short-conical; fruit ovoid to orbicular or ellipsoid, slightly compressed laterally, the mericarps subterete, with filiform, conspicuous ribs, the oil tubes solitary in intervals and 2 on commissure, the carpophore entire to 2-cleft.

LECTOTYPE SPECIES: *Apium graveolens* L. (vide Hitchcock, Prop. Brit. Bot. 142. 1929).

DISTRIBUTION: Principally Eurasia and the Southern Hemisphere, with about 30 species.

1. *Apium leptophyllum* (Pers.) F. v. Muell. ex Benth. Fl. Austral. **3**: 372. 1867; Turrill in J. Linn. Soc. Bot. **43**: 23. 1915; Yuncker in Bishop Mus. Bull. **178**: 92. 1943; Mathias & Constance in N. Amer. Fl. **28B**: 129. 1944; Yuncker in Bishop Mus. Bull. **220**: 208. 1959; J. W. Parham, Pl. Fiji Isl. 230. 1964, ed. 2. 320. 1972; Backer & Bakh. f. Fl. Java **2**: 175. 1965; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 208. 1970; Kraulik & Theob. in Rev. Handb. Fl. Ceylon **3**: 492. 1981.

Pimpinella leptophylla Pers. Syn. Pl. **1**: 324. 1805.

Apium ammi auct.; Sprague in J. Bot. **61**: 129. 1923; Wolff in Pflanzenr. **90** (IV. 228): 53. 1927; Greenwood in Proc. Linn. Soc. **154**: 94. 1943; non Urb.; non *Sison ammi* L.

Annual herb with ascending branches, 30–40 cm. high, occasional as a weed in gardens or along roadsides at elevations from near sea level to 850 m.; leaf blades usually pinnately decomposed, with ultimate divisions to 10×1 mm.; involucre and involucrel lacking; petals white; fruit to 3×2 mm. Flowers and fruits have been noted between June and January.

TYPIFICATION: Collector unknown, the original locality noted as "Ins. St. Dominica" (Dominican Republic?).

DISTRIBUTION: Tropical and temperate America, now also common in the Old World. The earliest record of this widespread plant in Fiji is apparently that of im Thurn in 1906 (Turrill, 1915); it seems sharply localized in Fiji.

AVAILABLE COLLECTIONS: VITI LEVU: Mba: Nandarivatu and vicinity, *im Thurn 140* (K), March 10, 1906, *Parks 20530*, *Gillespie 4332*, *Smith 5027*, *DA 2101*, *2108*, *17331*. REWA: Suva and vicinity, *H. B. R. Parham 30*, *Greenwood 713*, *H. W. Simmonds "M"*, *DA 11219*.

7. **FOENICULUM** Mill. Gard. Dict. Abridg. ed. 4. 1754; Mathias & Constance in N. Amer. Fl. **28B**: 121. 1944; Backer & Bakh. f. Fl. Java **2**: 177. 1965.

Slender, erect, caulescent, glabrous, glaucous, aromatic biennials or perennials, with taproots; leaves alternate, the petioles broadly sheathing, the blades membranaceous, pinnately decomposed, the ultimate divisions filiform; inflorescence of loose, compound umbels, the peduncles terminal and axillary, the involucre and involucrel lacking, the rays numerous, ascending; calyx lobes obsolete; petals obovate, yellow; styles very short, recurved, the stylopodium conical; fruits oblong, slightly compressed laterally, the mericarps subterete, with prominent ribs, the oil tubes solitary in intervals and 2 on commissure, the carpophore 2-parted.

LECTOTYPE SPECIES: Not indicated by ING (1979).

DISTRIBUTION: An Old World genus of several species, one of which has also become widely established in the Western Hemisphere.

1. **Foeniculum vulgare** Mill. Gard. Dict. ed. 8. 1768; Greenwood in Proc. Linn. Soc. **154**: 99. 1943; Yuncker in Bishop Mus. Bull. **178**: 93. 1943; Mathias & Constance in N. Amer. Fl. **28B**: 121. 1944; Buwalda in Fl. Males. I. **4**: 136. 1949; J. W. Parham, Pl. Fiji Isl. 231. 1964, ed. 2. 320. 1972; Backer & Bakh. f. Fl. Java **2**: 177. 1965; Purseglove, Trop. Crops, Dicot. 651. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 209. 1970.

Anethum foeniculum L. Sp. Pl. 263. 1753.

A coarse, anise-scented herb 0.4–2 m. high, occasionally cultivated near sea level and sparingly naturalized in shady waste places; leaf blades to 30×40 cm., with ultimate divisions to 40×5 mm.; petals yellow; fruit to 4×2 mm. Flowers have been noted in August.

TYPIFICATION: Linnaeus mentioned several earlier references, among which Miller listed *Foeniculum vulgare germanicum*, from Bauhin's Pinax 147. 1623.

DISTRIBUTION: Mediterranean region, now widely cultivated and sometimes naturalized. Presumably it was brought into Fiji as a cultivated plant and was first noted as naturalized by Greenwood (1943), but it is infrequent.

LOCAL NAMES AND USES: *Fennel*; Parham (1972) also mentions the names *pan mauri* and *sonf* (origin?). Leaves of the fennel are used as a potherb and the fruits as a flavoring; a medicinal seed oil is also obtained from the species.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRE: Mbatiki, Nanduruloulou, *DA 2603*. VANUA LEVU: MATHUATA: Lambasa, *Greenwood 653*.

8. *Petroselinum* J. Hill, Brit. Herb. 424. 1756; Mathias & Constance in N. Amer. Fl. **28B**: 131. 1944; Backer & Bakh. f. Fl. Java **2**: 175. 1965.

Slender, erect, caulescent, branching biennials, with taproots; leaves petiolate, the petioles sheathing, the blades membranaceous, ternately or pinnately decomposed, the ultimate divisions ovate to linear, dentate or lobed; inflorescence of loose compound umbels, the peduncles terminal and axillary; involucre of inconspicuous bracts or lacking, the rays few to numerous, the involucre of several short, linear bracteoles; calyx lobes obsolete; petals obovate, yellow or greenish yellow; styles short, spreading, the stylopodium low-conical; fruit ovoid to oblong, slightly laterally flattened, the mericarps with filiform, prominent ribs, the oil tubes solitary in intervals and 2 on commissure, the carpophore 2-cleft to base or middle.

LECTOTYPE SPECIES: *Petroselinum hortense* Hoffm. is listed by ING (1979), but this is considered a nomen nudum by Mathias and Constance (1944), who give as the type species *Petroselinum crispum*.

DISTRIBUTION: Europe and Mediterranean region, with four or five species.

1. *Petroselinum crispum* (Mill.) Nyman ex Airy Shaw in Kew Bull. **1938**: 256. 1938; Mansf. in Repert. Sp. Nov. **46**: 307. 1939; Mathias & Constance in N. Amer. Fl. **28B**: 132. 1944; Backer & Bakh. f. Fl. Java **2**: 175. 1965; Purselglove, Trop. Crops, Dicot. 652. 1968; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 209. 1970; J. W. Parham, Pl. Fiji Isl. ed. 2. 320. 1972.

Apium petroselinum L. Sp. Pl. 264. 1753.

Apium crispum Mill. Gard. Dict. ed. 8. 1768.

Petroselinum hortense Hoffm. Gen. Pl. Umbell. 163, nom. nud. 1814; Wolff in Pflanzenr. **90**(IV. 228): 63, nom. illeg. 1927; Yuncker in Bishop Mus. Bull. **178**: 93. 1943.

As noted in Fiji, the parsley is an occasionally cultivated herb 15-25 cm. high, grown at low elevations; leaf blades deltoid in outline, the ultimate divisions to 5 × 4 cm., petiolulate; fruits to 4 × 3 mm.

TYPIFICATION: Linnaeus mentioned several earlier publications and also a var. *β* ("Apium vel Petroselinum crispum. Bauh. pin. 153."). The epithet *crispum*, from Bauhin's Pinax 153. 1623, was apparently the source of Miller's name.

DISTRIBUTION: Europe and Mediterranean region, cultivated and naturalized elsewhere.

LOCAL NAME AND USE: Leaves of the *parsley* are edible as a condiment, used as a garnish and for flavoring.

AVAILABLE COLLECTION: VITI LEVU: NAITASIRE: Toninaiwau, Tholo-i-suva, DA 16760.

A pertinent nomenclatural discussion of the common parsley is that of Airy Shaw (1938). The first available epithet, *crispum*, was combined with *Petroselinum* by Nyman (Consp. Fl. Eur. 309. 1879) in synonymy, and Airy Shaw (followed by Mansfeld) indicated the combination as dating from Hand-List Herb. Pl. Kew, ed. 3. 122. 1925. That combination, however, is considered invalid (Backer & Bakh. f., 1965), and Airy Shaw should be considered the first combiner of the valid name.

ORDER LINALES

The Linales, as circumscribed by Cronquist (1981), are a well-defined group of four or five families with affinities toward the Geraniales and Rutales.

FAMILY 146. LINACEAE

LINACEAE S. F. Gray, Nat. Arr. Brit. Pl. **2**: 622, 639, as *Lineae*. 1821.

Trees, shrubs, lianas (sometimes climbing by means of hooks on branchlets), or herbs, stipulate (stipules inconspicuous, sometimes glandlike) or estipulate; leaves usually alternate (rarely opposite or whorled), simple; inflorescences terminal or axillary, cymose, racemiform, or paniculate, the flowers ♂, actinomorphic, hypogynous, (4- or) 5-merous; sepals free or connate at base, quincuncially imbricate; petals free, contorted in bud, often clawed; disk extrastaminal, mostly represented by 2-5 inconspicuous glands; stamens as many as or twice (or 3 times) as many as petals, sometimes alternating with small staminodes, the filaments usually connate proximally to form a tube, the anthers introrse, dehiscent lengthwise; ovary superior, 2-5-locular or falsely 10-locular by intrusive septa, the placentation axile, the ovules 2 per locule, collateral, anatropous, epitropous (with ventral raphe), pendulous from inner angle, the styles filiform, free or partially connate, the stigmas simple, capitate; fruit a septicidal capsule or a drupe, the seeds compressed, the endosperm copious, scanty, or absent, the embryo straight, the cotyledons flat.

DISTRIBUTION: Cosmopolitan, with about 13 genera and 300 species. One genus is indigenous in Fiji.

The Linaceae are readily divisible into two tribes, Hugonieae (including our genus) and Lineae (Hutchinson, 1967), or these groups are treated as subfamilies (Takhtajan, 1980) or as separate families (Cronquist, 1981).

1. *DURANDEA* Planch. in London J. Bot. 6: 594. 1847; Stapf in Hook. Icon. Pl. 29: pl. 2822. 1906; A. C. Sm. in Sargentina 1: 40. 1942, in J. Arnold Arb. 36: 279. 1955; Hutchinson, Gen. Fl. Pl. 2: 598. 1967. Nom. cons.

Scandent shrubs (rarely erect) or lianas, the branchlets often with conspicuous woody hooks, the stipules very small, caducous; leaves alternate, the blades chartaceous to coriaceous, often crenate-serrate; inflorescences terminal or axillary, cymose or paniculate or racemiform; flowers 5-merous, the sepals unequal, broadly imbricate, rounded, persistent in fruit, the petals contorted in bud, cuneate-unguiculate, fugacious; stamens 10, alternately slightly unequal, the filaments proximally united into a tube closely surrounding ovary; ovary 3-5-locular, the styles free, filiform, the stigmas cordate-discoïd; fruit a fleshy drupe with 3-5 pyrenes, these bony, 1-seeded, the seeds ovoid-oblong.

TYPE SPECIES: *Durandea serrata* Planch.

DISTRIBUTION: Eastern Malesia and eastern Australia to Fiji, with 14 or 15 species, the Fijian endemic species terminating the generic range.

Stapf indicates the relationship of the Fijian species to be with *Durandea jenkinsii* (F. v. Muell.) Stapf, of Queensland, differing in its less coriaceous leaf blades and more slender inflorescences, but his (1908) measurements of filaments and styles seem inaccurate. Like other species of *Durandea*, which is in need of a complete revision, *D. vitiensis* has the filaments appreciably longer than the styles.

1. *Durandea vitiensis* Stapf in Hook. Icon. Pl. 29: sub pl. 2822. 1906, in Kew Bull. 1908: 13. 1908; A. C. Sm. in Sargentina 1: 40. 1942, in J. Arnold Arb. 36: 279. 1955; J. W. Parham, Pl. Fiji Isl. 122. 1964, ed. 2. 174. 1972. FIGURES 158, 159.

High-climbing liana or scandent shrub, occasional in dense or open forest from near sea level to about 400 m., glabrous throughout, climbing by means of woody, paired hooks borne on branchlets below leaf flushes or below inflorescences; leaves variable in size, with petioles (4-) 8-18 mm. long, the blades chartaceous, oblong-elliptic or lanceolate, (6-) 8-17 × (2-) 3-6.5 cm., inconspicuously crenulate-serrate, the venation prominulous on both surfaces; inflorescences narrowly paniculate or racemiform, to 12 × 3 cm., with conspicuous, oblanceolate bracts to 2 cm. long or these replaced by small leaves, the pedicels 4-8 mm. long; sepals broadly oblong, 2.5-3.5

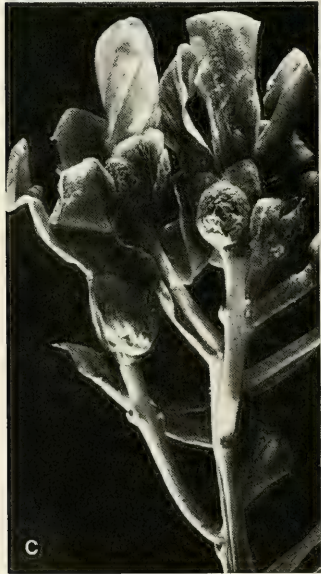




FIGURE 159. *Durandea vitiensis*: A, gynoecium, with 2 petals and 4 stamens, $\times 8$; B, fruits, $\times 4$. A from DA 11584, B from Degener 15075.

mm. long and broad; petals yellow to orange, obovate-oblong, 10–11.5 \times 3–4 mm.; filaments alternately about 7 and 8 mm. long including the proximal tube 1.5–2 mm. long, the anthers about 0.5 mm. long; ovary ovoid, about 1.5 mm. long at anthesis, the styles 5, free to base, about 2.5 mm. long; fruits subglobose-ovoid, to 10 mm. in diameter at maturity, conspicuously 15-costate when dry, the styles subsistent. Flowers have been observed between January and May, fruits in April and May.

TYPIFICATION: The type is *Storck 4* (K HOLOTYPE; ISOTYPE at GH), collected in Fiji without further data. Stapf in his first description (1906) of *Durandea vitiensis* cited the number as 41, but in 1908 it was correctly cited as 4.

DISTRIBUTION: Endemic to Fiji and probably limited to southeastern Viti Levu; many of Storck's collections came from the Rewa River area.

AVAILABLE COLLECTIONS: VITI LEVU: SERUA: Vicinity of Ngaloa, DA 14855; Vatuvilakia, vicinity of Ngaloa, Degener 15149; near Mt. Nggamu, east of Ngaloa, Degener 15075. NAMOSI: Nambukavesi Creek, DA 11584. NAITASIRI: Navolau, Rewa River, DA 633; Sawani-Serea road, DA 16619; Central road, MacDaniels 1161, Tothill 200 (near Tholo-i-suva); Prince's Road, beyond Forest Reserve, Vaughan 3358; vicinity of Tamavua, Yeoward 90. REWA: Mt. Korombamba, Gillespie 2378, DA 1178. FIJI without further locality, Gillespie 2380, s. n.

FIGURE 158. *Durandea vitiensis*: A, distal portion of branchlet, with foliage and inflorescences, $\times 1/4$; B, short branchlet with hooks borne under a withered inflorescence, $\times 1/2$; C, portion of inflorescence, $\times 4$; D, flower, 2 sepals and 3 petals removed, $\times 8$. A, C, & D from DA 11584, B from MacDaniels 1161.

ORDER CELASTRALES

KEY TO FAMILIES OCCURRING IN FIJI

- Ovules usually erect and borne on axile placenta near its base (infrequently apical-axile), bitegmic, 2 (rarely 1) or more per locule; disk well developed; leaves opposite or subopposite, infrequently alternate.
- Flowers unisexual or ♂, usually isomerous, the stamens usually as many as petals, borne on disk or below its outer margin, the anthers dehiscing laterally or introrsely lengthwise, rarely obliquely; ovules usually 2 (1-6, rarely more) per locule; fruits in our genera capsules or drupes, the seeds in capsules with well-developed arils or arillodes, the endosperm copious (rarely lacking).
147. CELASTRACEAE
Flowers ♀, usually anisomerous, the stamens usually 3, borne within disk, the anthers usually dehiscing by confluent transverse clefts (these usually horizontal to oblique); ovules 2-14 (-20) per locule; fruits in our genus drupaceous, the seeds exarillate, without endosperm. 148. HIPPOCRATEACEAE
- Ovules pendulous, apical or nearly so, 1 or 2 per locule; disk lacking or small and inconspicuous; stamens usually as many as petals, the anthers dehiscing lengthwise (in all our representatives); fruit drupaceous; leaves alternate (in all our representatives), rarely opposite.
- Stipules lacking or vestigial; disk lacking (in our representatives) or infrequently present and small; ovules unitegmic; seeds with abundant endosperm.
- Flowers not articulated below calyx; petals or corolla lobes imbricate (in our genus), rarely valvate; ovary usually 4-6-locular, the ovules usually 1 per locule, rarely 2; drupe subglobose to ellipsoid and berrylike in our genus, the pyrenes usually 1-seeded. 149. AQUIFOLIACEAE
- Flowers articulated below calyx; petals or corolla lobes valvate, rarely subimbricate; ovary usually with 1 functional (fully developed and ovuliferous) locule, the ovules usually 2, rarely 1; drupe ellipsoid to subglobose, symmetrical or flattened, the seed 1. 150. ICACINACEAE
- Stipules present; pedicels in our genus articulated near apex; petals in our genus 2-lobed at apex and free; disk present, in our genus composed of 5 small, free (in our species) or united glands; ovules bitegmic, 2 per locule; drupe 1-3-lobed (each locule 1-seeded), the seeds without endosperm.

151. DICHAPETALACEAE

FAMILY 147. CELASTRACEAE

CELASTRACEAE R. Br. in Flinders, Voy. Terra Australis 2: 554, as *Celastrinae*. 1814.

Trees or shrubs, sometimes scandent, usually glabrous, sometimes with elastic or resinous threads in vegetative and inflorescence parts, estipulate or with small, caducous stipules; leaves opposite or alternate, simple; inflorescences terminal or axillary, cymose or fasciculate or racemose, sometimes 1-flowered, usually bracteate, the flowers usually small, ♂ or unisexual, actinomorphic, hypogynous to semi-epigynous, 4- or 5-merous, usually isomerous; calyx with separate sepals or lobed to middle, the sepals or lobes imbricate or rarely valvate; petals free, imbricate, contorted, or rarely valvate, rarely absent; stamens usually as many as petals and alternate with them, borne on disk or below its outer margin, the anthers 2-locular, dehiscing laterally or introrsely lengthwise, rarely obliquely; disk usually well developed and fleshy, usually intrastaminal, often adnate to ovary; ovary superior or rarely semi-inferior, 2-5-locular, the placentation axile, the ovules usually 2 (1-6, rarely more) per locule, erect or infrequently pendulous, anatropous, apotropous (rarely epitropous), the style short and usually simple, the stigma capitate or lobed; fruit a capsule, samara, berry, or drupe, the seeds often with well-developed and bright-colored arils or arillodes, the endosperm copious (rarely lacking), the cotyledons large, flat.

DISTRIBUTION: Pantropical and subtropical, sometimes extending into temperate areas, with about 50 genera and 800 species. Three genera are indigenous in Fiji, each represented by a single species.

USEFUL TREATMENTS OF FAMILY: DING HOU. *Celastraceae*—I. Fl. Males. I. 6: 227-291. 1963. LOBREAUCALLEN, D. Deux genres de *Celastraceae* Cassine L. et *Maytenus* Mol. revus a la lumière de la palynologie. *Adansonia* 15: 215-224. 1975.

KEY TO GENERA

- Fruit a loculicidally dehiscent capsule, the seeds arillate; flowers (of our species) unisexual; leaves (of our species) alternate, spirally arranged.
- Inflorescences (of our species) terminal on branchlets, narrowly thyrsoid or racemiform, longer than broad; seeds enveloped by a fleshy aril, this becoming split distally into broad, irregular lobes; our species a liana or scrambling woody vine or scandent shrub. 1. *Celastrus*
- Inflorescences axillary, in our species cymose, spreading, about as broad as long; seeds with a basal, carunculiform aril; our species a small tree or shrub, sometimes scandent. 2. *Maytenus*
- Fruit a drupe, indehiscent, the seeds exarillate; flowers (of our species) ♂; leaves (of our species) opposite or subopposite, decussate; our species a tree. 3. *Cassine*

1. ***Celastrus*** L. Sp. Pl. 196. 1753; Seem. Fl. Vit. 40. 1865; Loesener in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **20b**: 131. 1942; Ding Hou in Ann. Missouri Bot. Gard. **42**: 227. 1955, in Fl. Males. I. **6**: 233. 1963.

Dioecious (our species) or hermaphrodite scandent shrubs or lianas, the branchlets usually conspicuously lenticellate, the stipules small, caducous; leaves spirally arranged, the blades crenate to subtire; inflorescences terminal (as in our species) or axillary, solitary, thyrsoid, pyramidal, or racemiform, few-many-flowered; flowers 5-merous, usually unisexual (as in our species), rarely ♀, the pedicels articulated; calyx campanulate, persistent, the lobes imbricate (as in our species) or valvate; petals spreading, oblong to ovate, ciliate to erose or entire; disk cupuliform or flat, entire or 5-lobed; stamens (reduced and sterile in ♀ flowers) inserted on or under outer margin of disk, the anthers ovoid to oblong, introrse or latrorse, dorsifixed, versatile, the locules proximally separate; ovary (reduced and sterile in ♂ flowers) free from disk or basally slightly confluent with it, completely or incompletely 3-locular, the ovules 2 (as in our species) and collateral or 1 per locule, basally attached at inner angle, with a cupular basal aril, the style short, persistent, the stigma usually obscurely 3-lobed; fruits capsular, loculicidally 3-valved, the valves eventually spreading, the seeds 1-6 (usually 3 in our species), enveloped by a fleshy aril.

LECTOTYPE SPECIES: *Celastrus scandens* L. (vide Britton & Brown, Ill. Fl. N. U. S. ed. 2. **2**: 492. 1913), one of the original five species.

DISTRIBUTION: Pantropical and subtropical, extending into temperate areas, with about 31 species (Ding Hou, 1955); in the Pacific occurring eastward to Fiji, where it is represented by an endemic species. The genus should have been included in my 1955 discussion (in J. Arnold Arb. **36**: 281).

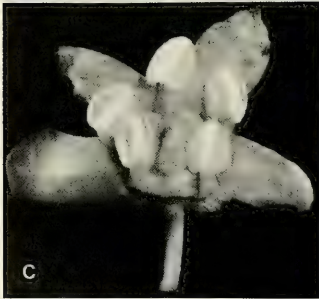
USEFUL TREATMENT OF GENUS: DING HOU. A revision of the genus *Celastrus*. Ann. Missouri Bot. Gard. **42**: 215-302. 1955.

1. ***Celastrus richii*** A. Gray, Bot. U. S. Expl. Exped. **1**: 289. 1854; Seem. Viti, 434. 1862, Fl. Vit. 40. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 138. 1890; Loesener in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **20b**: 133. 1942; Ding Hou in Ann. Missouri Bot. Gard. **42**: 237. 1955; J. W. Parham, Pl. Fiji Isl. 149. 1964, ed. 2. 214. 1972.

FIGURE 160.

Liana or scrambling woody vine or scandent shrub, found at elevations from near sea level to about 900 m. in dense, dry, or open forest and in the thickets of crests and hillsides. The petals and filaments are white, the anthers pale yellow, and the fruits green, turning to dull yellow; the seeds are covered by a red or orange aril. Flowers have been noted between December and August, fruits between February and September.

TYPIFICATION: The type is *U. S. Expl. Exped.* (US 16348 HOLOTYPE; ISOTYPE at GH), collected in 1840 on Vanua Levu without further locality.



DISTRIBUTION: Endemic to Fiji; occasional but not abundant, now known from six of the islands and 32 collections.

LOCAL NAMES AND USES: Recorded local names are *ndrau ni sendre, vere, wa vere, wa masi, vereloa*, and *taka*. The plant is reputed to have medicinal uses, such as the leaves being chewed as a remedy for toothache.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Naruarua Gulch, west of Mbatinaremba, *St. John 18053*. MAMANUTHAS: NGGALITO Island, Malolo Group, *O. & I. Degener 32223*. VITI LEVU: MBA: Korovou, near Nandi, *Degener 15330*; northern portion of Mt. Evans Range, between Mt. Vatuyanitu and Mt. Natondra, *Smith 4301*; slopes of escarpment north of Nandarivatu, *Smith 6085*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 11722*; Nathotholevu, near Singatoka, *H. B. R. Parham 462*; Mbulu, near Sovi Bay, *Degener 15050*. RA: Mountains near Penang, *Greenwood 771*; Mataimeravula, vicinity of Rewasa, near Vaileka, *Degener 15427*. OVALAU: Slopes of Mt. Koronimoko, vicinity of Thawathi, *Smith 8071*. VANUA LEVU: MBUA: Vicinity of Nasau, Rukuruku Bay, *H. B. R. Parham 1*. MATHUATA: Along coast, *Greenwood 202A*. THAKAUNDRIVE: Navonu Creek, Natewa Peninsula, *DA 13414*. FULANGA: On limestone formation, *Smith 1122*.

The Fijian species (Ding Hou, 1955) falls into subgen. *Celastrus* (ovules 2) ser. *Paniculati* (inflorescence terminal) and is allied to *C. subspicatus* Hook., of Australia, New Guinea, and New Caledonia, differing primarily in its glabrous branchlets, thin, membranaceous leaf blades, and accrescent pedicels (to 15 mm. long in fruit).

2. MAYTENUS Molina, Saggio Stor. Nat. Chile, 177, 349. 1782; Loesener in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **20b**: 134. 1942; Ding Hou in Fl. Males. I. **6**: 238. 1963.

Celastrus sect. *Gymnosporia* Wight & Arn. Prodr. Fl. Ind. Orient. 159. 1834.

Gymnosporia Hook. f. in Benth. & Hook. f. Gen. Pl. **1**: 365. 1862; Seem. Fl. Vit. **40**. 1865; Loesener in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **20b**: 147. 1942. Nom. cons. sed non vs. *Maytenus*.

Small trees or shrubs, sometimes scandent, often spiny, the stipules small, lanceolate, caducous, sometimes lacking; leaves spirally arranged (rarely opposite) or fasciculate on short shoots; inflorescences axillary, solitary or aggregated, cymose or fasciculate; flowers (4- or 5-merous, ♂ or unisexual, the pedicels articulated; calyx deeply lobed; petals elliptic to ovate, spreading or reflexed after anthesis; disk flat or rarely cupular; stamens (abortive in ♀ flowers) inserted on or under outer margin of disk, the filaments subulate, the anthers dorsifixed, introrse; ovary partially immersed in disk, completely or incompletely (2- or 3-) locular, the ovules 2 per locule, attached on septum near base, the stigmas slender, lobed or obscure; fruits capsular, subglobose or subangular, loculicidally (2- or 3-) 3-valved, the seeds 2-6, ellipsoid, with a small aril enveloping the base.

TYPE SPECIES AND NOMENCLATURE: The type species of *Maytenus* is *M. boaria* Molina; that of *Gymnosporia* is *G. montana* (Roth ex Roemer & Schultes) Benth. (*Celastrus montanus* Roth ex Roemer & Schultes), typ. cons. In his 1955 revision of *Celastrus*, Ding Hou (pp. 216, 217) concluded that *Gymnosporia* should be maintained as distinct from *Maytenus*, but upon further consideration (1963) he agreed with most other current students in uniting the genera, a viewpoint here adopted.

DISTRIBUTION: Pantropical and subtropical, with perhaps about 300 species, one of which is indigenous in Fiji.

FIGURE 160. *Celastrus richii*: A, distal portion of branchlet, with foliage and a terminal inflorescence with ♀ flowers past anthesis, most petals fallen, × 1/2; B, distal portion of branchlet, with foliage and infructescences, × 1/2; C, ♂ flower with 1 petal removed, × 8; D, young fruit with 1 valve removed, showing 2 aril-covered seeds, × 3; E, dehiscent fruits, × 3. A from *Smith 1122*, B from *Smith 6085*, C from *Degener 15427*, D from *Degener 15330*, E from *Smith 4301*.

1. *Maytenus vitiensis* (A. Gray) Ding Hou in Fl. Males. I. 6: 242. 1963. FIGURE 161.

Catha vitiensis A. Gray, Bot. U. S. Expl. Exped. 1: 287. 1854, Atlas, pl. 23. 1856; Seem. in Bonplandia 9: 255. 1861, Viti, 434. 1862.

Gymnosporia vitiensis Seem. Fl. Vit. 40. 1865; Loesener in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20b: 152. 1942; Yuncker in Bishop Mus. Bull. 220: 172. 1959; J. W. Parham, Pl. Fiji Isl. 149. 1964, ed. 2. 214. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 58. 1970.

Celastrus vitiensis Benth. & Hook. f. ex Drake, Fl. Polynés. Franç. 30. 1893; F. Br. in Bishop Mus. Bull. 130: 158. 1935.

Gymnosporia montana var. *samoensis* Lauterb. & Loesener in Bot. Jahrb. 41: 229. 1908.

Gymnosporia samoensis Loesener in Denkschr. Akad. Wiss. Wien 85: 304. 1910; Christophersen in Bishop Mus. Bull. 128: 128. 1935; Loesener in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20b: 151. 1942.

As seen in Fiji, *Maytenus vitiensis* is a sometimes scandent shrub or small tree 1-7 m. high, occurring at elevations from near sea level to 1,050 m. and often locally abundant in dense, dry, or secondary forest, in ridge forest, in thickets on beaches and hillsides, and on sea cliffs, often on limestone. The petioles and inflorescence branches are sometimes pink-tinged, as are the sepals of the fragrant flowers; the petals and filaments are white or cream-colored, the ovary and disk are greenish, and the fruits are green becoming red or dull purple, the seeds with a reddish aril. Flowers and fruits seem to occur throughout most of the year.

TIPIFICATION AND NOMENCLATURE: The type of *Catha vitiensis* is U. S. Expl. Exped. (US 16303 HOLOTYPE; ISOTYPE at K), collected in 1840 on Ovalau. (Another Exploring Expedition collection, US 16302, has smaller leaves and a more compact inflorescence and is not part of the type.) *Gymnosporia montana* var. *samoensis* is based on *Vaupel 152* (B HOLOTYPE presumably destroyed; ISOTYPE at BISH), collected Feb. 21, 1906, behind Manase, Savai'i, Samoa; this taxon, raised to specific rank by Loesener, seems inseparable from *Maytenus vitiensis*.

DISTRIBUTION: Fiji to the Society, Austral, and Gambier Islands; it is abundant in many Polynesian archipelagoes, and ample material has now been examined from Samoa, Tonga, Niue, the Cook, Society, and Austral Islands (including Rapa), and Mangareva. From Fiji I have examined 75 collections from ten islands, but the species may be anticipated on many other islands.

LOCAL NAMES: The name *matandra* seems to be applied to this species on several islands of the Lau Group, where it is a frequent and well-known plant. Other recorded names, perhaps not reliable, are *ngilangila* and *molimoli* (Mba), *rongga* (Mbua), *vundivundi* (Mathuata), *rounda* (Moala), and *sinu* (Vanua Mbalavu).

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Vicinity of Tumbenasolo, valley of Namosi Creek, *Smith 4621*; vicinity of Nandarivatu, *Vaughan 3404*; summit of Mt. Nanggaranambuluta, east of Nandarivatu, *Gillespie 3925*. NANGRONGA & NAVOSA: Thuvu, on beach, west of Singatoka, *Greenwood 67*. SERUA: Hills east of Navua River, near Nukusere, *Smith 9131*; vicinity of Ngaloa, *Degener 15208*; Loloma Beach, *Ndeumba, DA 16642*. NAMOSI: Vicinity of Namuamua, *Gillespie 3075*. RA: Vicinity of Rewasa, near Vaileka, *Degener 15464*. NAITASIRI: Nanggarathangithangi, Mendrausuthu Range, *DA 15034*. TAILEVU: Nukurua Creek, *DA 1019*. REWA: Mt. Korombamba, *Vaughan 3449*. VITI LEVU without further locality, *Seemann 86*. OVALAU: Hills southeast of valley of Mbureta River, *Smith 7443*; hillsides above Levuka, *Gillespie 4406*. VANUA LEVU: MBUA: Southern portion of Seatovo Range, *Smith 1555*. MATHUATA: Seanggangga, near District Farm, *DA 14443*. THAKAUNDOVE: Mt. Uluinambathi, Savusavu Bay region, *Degener & Ordonez 13955*. MOALA: Near Maloku, *Smith 1329*. MATUKU: On summit ridges, *Bryan 269*. VANUA MBALAVU: Nambavatu, northern limestone section, *Tothill 71*. AIWA: Central wooded basin, *Bryan 526*. KAMBARA: *Smith 1257*. FULANGA: *Tothill 71a*. ONGEA LEVU: Central flat forest, *Bryan 435*.

FIGURE 161. *Maytenus vitiensis*; A, ♂ flowers, × 6; B, ♀ flower, × 20; C, distal portion of branchlet, with foliage and infructescences, × 1/3; D, dehiscent fruits, a seed detached to show the basal carunculiform aril, × 3. A from *DA 14443*, B from *Smith 1257*, C from *Smith 1329*, D from *Bryan 269*.



In proposing his new combination for the Pacific species, Ding Hou compared it with *Maytenus emarginata* (Willd.) Ding Hou (including *Gymnosporia montana*, the conserved type of that genus), a widespread species occurring from southeastern Asia and Ceylon to northern Queensland and New Guinea, indicating that *M. vitiensis* differs in its ciliate calyx lobes. The two species are much alike, although *M. vitiensis* is never spinose, and its leaf blades, rounded to subacute at apex, have margins that are always distinctly crenulate-serrate; also, it has smaller fruits but usually larger seeds than those described for *M. emarginata*, with a reddish rather than white aril.

Another close relative of *Maytenus vitiensis* is *M. crenata* (Forst. f.) Loeb.-Callen (in Adansonian 15: 223. 1975; *Celastrus crenatus* Forst. f. Fl. Ins. Austr. Prodr. 19. 1786, emend. F. Br. in Bishop Mus. Bull. 130: 158. 1935; *Catha crenata* A. Gray, Bot. U. S. Expl. Exped. 1: 288. 1854; *Gymnosporia crenata* Seem. Fl. Vit. 41. 1865), endemic in the Marquesas. The two species seem readily separable, but only in matters of detail, *M. crenata* being more robust in facies and with somewhat larger leaves, flowers, and fruits, as noted in the following key. Should they eventually be combined, Forster's epithet is of course the earlier.

Flowers 5-7 (-9) mm. in diameter at anthesis, the petals 2-3 (-4) × 1-2 mm.; fruits with valves 6-9 (-12) × 5-9 mm., the seeds 3.5-5.5 (-6) × 2-4 mm.; petioles 3-9 (-12) mm. long; leaf blades obovate to ovate or elliptic, (3-) 4-12 × (1.5-) 2-7 cm., rounded to obtuse or subacute at apex. *M. vitiensis*
 Flowers 8-9 mm. in diameter at anthesis, the petals 4-4.5 × 1.5-2.5 mm.; fruits with valves 10-15 × 8-10 mm., the seeds 5-7 × 3-4.5 mm.; petioles 7-15 mm. long; leaf blades ovate or elliptic, (4-) 5-13 × (2.5-) 3-8 cm., obtuse to subacute at apex. *M. crenata*

3. *CASSINE* L. Sp. Pl. 268. 1753; Loesener in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20b: 176. 1942; Ding Hou in Fl. Males. I. 6: 284. 1963.

Elaeodendron Jacq. in Nova Acta Hel. Phys.-Math. 1: 36. 1780-1784 ("1787"); Loesener in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20b: 172. 1942; A. C. Sm. in J. Arnold Arb. 36: 281. 1955.

Trees or shrubs, the stipules small, caducous; leaves opposite or subopposite, decussate (or alternate), the blades coriaceous to papyraceous, entire to crenate-serrate; inflorescences axillary or extra-axillary, cymose, pedunculate; flowers 4- or 5-merous, ♂ (as in our species) or unisexual; calyx lobes semiorbicular, imbricate; petals imbricate, spreading; disk flat, thick, orbicular to angled; stamens inserted on or under outer margin of disk, the filaments subulate or filiform, the anthers dorsifixed, versatile, introrse; ovary adnate to disk at base or partially immersed in it, 2-5-locular (2-4-locular in our species), the ovules 2 per locule, erect from base, the style short or obscure, the stigma subpeltate to slightly lobed; fruits drupaceous, indehiscent, 1-3-locular, the exocarp thin or fleshy, the endocarp leathery, bony, or ligneous (as in our species), the seeds 1 (rarely 2) per locule, exarillate.

LECTOTYPE SPECIES: *Cassine peragua* L. (vide Mill. Gard. Dict. Abridg. ed. 4. 1754), one of the two original species. The type species of *Elaeodendron* is *E. orientalis* Jacq. Ding Hou (1963) summarizes the case for combining the two genera.

DISTRIBUTION: Pantropical, mostly African, with about 80 species. A Fijian endemic species terminates the paleotropical range of the genus to the east.

1. *Cassine vitiensis* (A. C. Sm.) A. C. Sm. in Contr. U. S. Nat. Herb. 37: 78. 1967; J. W. Parham, Pl. Fiji Isl. ed. 2. 214. 1972. FIGURE 162.

Elaeodendron vitiense A. C. Sm. in J. Arnold Arb. 31: 289. 1950, in op. cit. 36: 281. 1955; J. W. Parham, Pl. Fiji Isl. 149. 1964.

Tree 8-20 m. high, infrequent in dense or dry forest or in hillside thickets at elevations of 50-800 m. The petals and filaments are greenish yellow to pale yellow, the anthers a brighter yellow, and the disk is green to pale yellow; the available fruits, even

those that seem essentially mature, are green. Flowers have been obtained between September and December and also in May, fruits in November, December, and May.

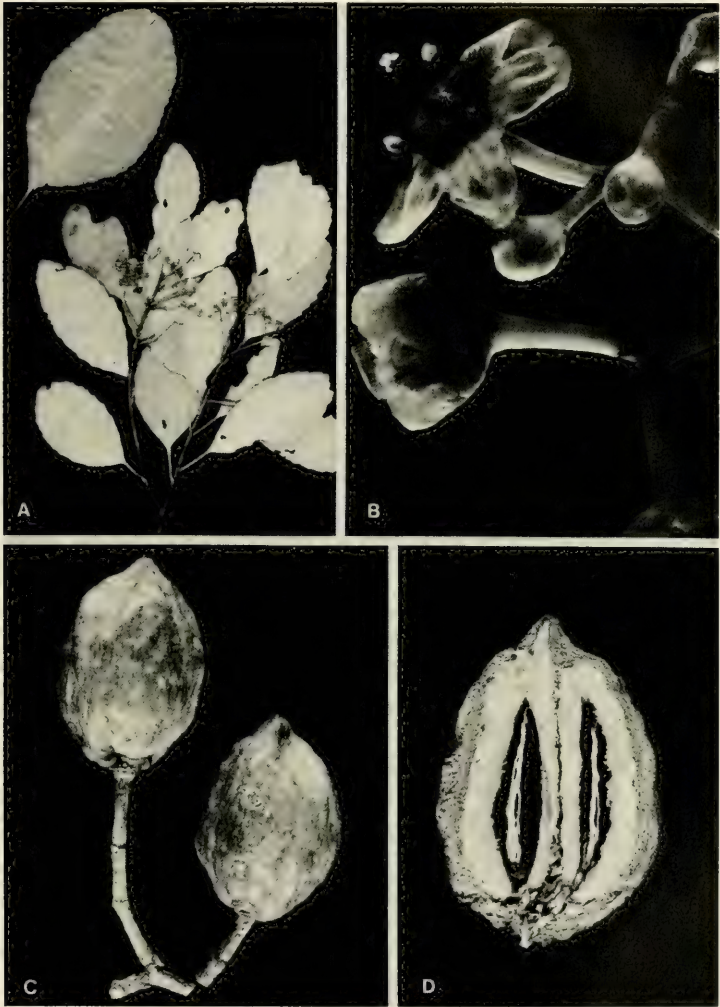


FIGURE 162. *Cassine vitiensis*: A, distal portion of branchlet, with foliage and inflorescences, $\times 1/3$; B, flowers, the open one with 2 anthers fallen, $\times 6$; C, fruits, $\times 2$; D, longitudinal section of fruit, $\times 3$. A & B from Smith 6259 (detached leaf in A from Smith 7450), C & D from Smith 7450.

TYPIIFICATION: The type is *Smith 6259* (A HOLOTYPE; many ISOTYPES), collected Sept. 29, 1947, on slopes of the escarpment north of Nandarivatu, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and thus far known to be indigenous on Viti Levu and Ovalau. The occurrence of this species on the Lauan island Thithia (cited below) is unexpected, and the possibility of its having been introduced there must be considered, as the collectors noted that it was growing near the house of the Manager of the Thithia Estate.

LOCAL NAME: The name *kau loa* was noted for the type collection.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Slopes of Mt. Nanggaranambuluta, east of Nandarivatu, *Gillespie 4069*. SERUA: Hills between Wainiggere and Waisee Creeks, between Ngaloa and Wainiyambia, *Smith 9385*. OVALAU: Without further locality, *Graeffe 1363*; hills southeast of valley of Mbureta River, *Smith 7450*. THITHIA: *DA 17706* (coll. *D. Koroiveibau & S. Makasiale*, May 6, 1971).

The closest relative of the Fijian endemic appears to be *Cassine glauca* var. *cochinchinensis* Pierre, of Cambodia and a few localities in Malesia to Timor and the Moluccas (cf. Ding Hou, 1963), from which it differs in its longer petioles, somewhat thinner leaf blades which are attenuate at base and long-decurrent on the petiole, larger petals, and fruits with a thinner endocarp (1–2 mm. thick) and with two (perhaps three or four) separable pyrenes and two (or more?) seeds.

FAMILY 148. HIPPOCRATEACEAE

HIPPOCRATEACEAE Juss. in *Ann. Mus. Hist. Nat. (Paris)* **18**: 486, as *Hippocrateaceae*. 1811.

A family closely related to Celastraceae and often combined with it; shrubs or slender trees or predominantly lianous; leaves opposite or subopposite, infrequently alternate; flowers ♂, usually anisomerous; sepals rarely calyptiform or circumscissile; stamens 3 (infrequently 2–5), borne within disk, the filaments often expanded at base, the anthers usually dehiscent by confluent transverse clefts (these usually horizontal or oblique, sometimes extrorse); disk extrastaminal, rarely pseudocontinuous or disjunct; ovules 2–14 (–20) per locule, usually attached to axile placenta near its base; style rarely lacking; stigmas rarely sessile on ovary and radiating, rarely obscure; fruit a loculicidally dehiscent capsule (then usually extended into 3 large wings and with basally winged seeds) or drupaceous, the seeds usually exarillate, without endosperm.

DISTRIBUTION: Pantropical and subtropical, with about 25 genera and 300 species. One genus is indigenous in Fiji.

USEFUL TREATMENT OF FAMILY: DING HOU. *Celastraceae—II. Fl. Males. I.* **6**: 389–421. 1964.

Separation of Celastraceae and Hippocrateaceae at the familial level remains controversial. Ding Hou (in *Blumea* **12**: 31–38. 1961, in 1964, pp. 389–390, and in several more recent papers) has convincingly argued that there are several intermediate genera and too many exceptions to permit familial separation, and indeed he does not even retain the groups as subfamilies or tribes (as do most authors who combine them). It is largely a matter of personal preference whether to combine the families (Ding Hou, 1961, 1963, 1964; Thorne, 1976; Takhtajan, 1980) or to recognize them as intimately related but separable (Scholz in Melchior, 1964; Brizicky in J. Arnold *Arb.* **45**: 223. 1964; Hutchinson, 1973; Cronquist, 1981). Some of the exceptional genera are often (or perhaps should be) removed from both families.

1. SALACIA L. *Mant. Pl.* 159. 1771; A. C. Sm. in *Brittonia* **3**: 423. 1940; Loesener in *Engl. & Prantl, Nat. Pflanzenfam. ed. 2.* **20b**: 217. 1942; A. C. Sm. in J. Arnold

Arb. 36: 281. 1955; Ding Hou in Fl. Males. I. 6: 404. 1964.

Lianas or scandent shrubs (rarely erect shrubs or small trees), glabrous throughout or essentially so, the branchlets often swollen or somewhat flattened at nodes; leaves opposite or subopposite, rarely alternate; inflorescences axillary or borne on defoliate branchlets, fasciculate, cymose, thyriform, or paniculiform; calyx deeply 5-lobed (rarely 3-5-lobed, rarely circumsessile), the lobes usually broadly imbricate and often unequal, often scarious or erousulous at margin; petals 5 (rarely 4-7), narrowly imbricate, usually rotate at anthesis; disk extrastaminal, fleshy, annular-pulvinate, truncate-conical, or flattened; stamens 3 (rarely 2 or 4), inserted at base of free part of ovary, usually reflexed at anthesis, the filaments subulate, usually broadened proximally, the anthers basifixed, transversely oblong or ellipsoid, transversely to obliquely dehiscent by usually apically confluent clefts; ovary partially immersed in disk, often subtrigynous, (2- or) 3-locular, the ovules 2-8 per locule, collateral or superposed or 2-seriate, the ovary gradually narrowed into a carnos, subulate style, this distinct or obscure, the stigmas obscure; fruit drupaceous, subglobose to ellipsoid, 1-3-locular, the pericarp drying coriaceous, the dissepiments soon evanescent and becoming mucilaginous, the seeds 1-several, embedded in mucilaginous pulp, ellipsoid-oblong, angled and irregular by mutual pressure, the cotyledons massive, free or united.

TYPE SPECIES: *Salacia chinensis* L.

DISTRIBUTION: Pantropical, perhaps with about 150 species. Two species are indigenous in Fiji. In 1955 I indicated the paleotropical portion of the range to terminate to the east in Fiji, but this is seen to be inaccurate, as one of the Fijian species is now known to extend to Tonga.

In his 1964 treatment of *Salacia*, Ding Hou accepts 29 species in Malesia; he does not mention the Fijian species by name, but it would seem (p. 419) that he intends to submerge them in his concept of *S. chinensis* L., a species indicated as widely dispersed from India, Ceylon, Burma, Hainan, etc., throughout Malesia to the Caroline Islands, Queensland, the Solomon Islands, "and as far as Fiji." I am not prepared to comment on Ding Hou's broad interpretation of *S. chinensis* (which has a somewhat less than satisfactory type, cf. A. C. Smith in Brittonia 3: 351. 1940) to incorporate the Malesian species *S. prinoides* (Willd.) DC., but quite evidently the most collective concept of this conglomerate cannot be taken to include the two Fijian species. These have fruits 2.5-5 cm. in diameter, sometimes obscurely ridged in the distal third and with a thick and woody pericarp 2-5 mm. thick, and with (1-) 4-6 fully developed seeds 16-30 × 8-22 mm. *Salacia prinoides* (*S. chinensis*?) has fruits not exceeding 2 cm. in diameter, with a thin and brittle pericarp 0.5-1 mm. thick, and with only 1 or 2 developed seeds 10-15 mm. long and broad. A closer relative than *S. prinoides* (*S. chinensis*?) of the two Fijian species is *S. aneityensis* Guillaumin, of the New Hebrides (which I misinterpreted in Amer. J. Bot. 28: 441. 1941, but more appropriately recognized as distinct in Sargentia 1: 53. 1942).

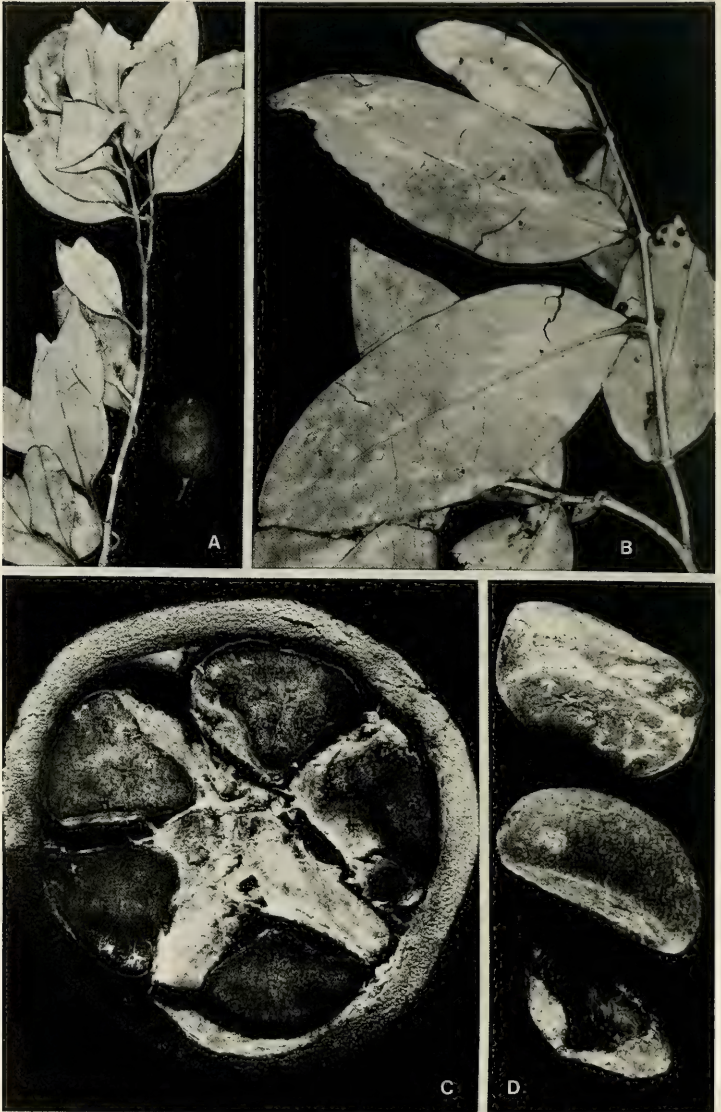
Although the two Fijian taxa, on the basis of material now at hand, have essentially similar fruits, and although both have fasciculate and inconspicuous inflorescences, foliage and floral differences permit their separation.

KEY TO SPECIES

Petioles to 1.5 cm. long; leaf blades prevailing oblong-elliptic, 4-10.5 × 2-5.5 cm., subacute or obtuse at base; flowers 6-11 mm. in diameter, the petals elliptic, 3.5-5 × 1.5-3 mm., narrowed at base.

1. *S. vitiensis*

Petioles sometimes to 3 cm. long; leaf blades prevailing ovate-elliptic, (6-) 8-18.5 × (3-) 3.5-10 cm., rounded to obtuse at base or sometimes narrowly subcordate; flowers 4-5 mm. in diameter, the petals oblong, 1.7-2.5 × 1.3-1.5 mm., not much narrower at base. 2. *S. pachycarpa*



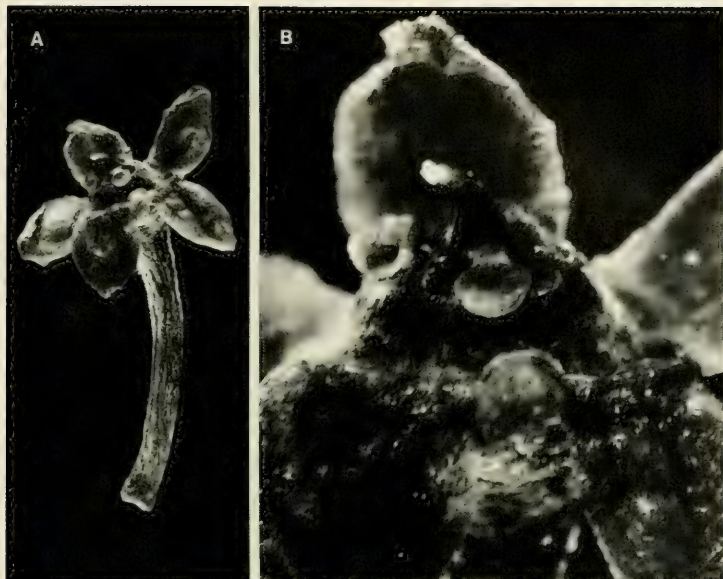


FIGURE 164. *Salacia pachycarpa*, from Greenwood 1276; A, flower, $\times 8$; B, central portion of flower, showing a sepal projecting between 2 reflexed petals, disk, stamens, ovary, and style, $\times 30$.

1. *Salacia vitiensis* A. C. Sm. in Amer. J. Bot. 28: 440. 1941, in Sargentia 1: 53. 1942, in J. Arnold Arb. 31: 290. 1950, in op. cit. 36: 281. 1955; J. W. Parham, Pl. Fiji Isl. 149. 1964, ed. 2. 214. 1972. FIGURE 163A, C, D.

Salacia prinoides sensu A. C. Sm. in Bishop Mus. Bull. 141: 89. 1936; non DC.

Liana, occasional in dense or open forest at elevations from near sea level to about 700 m. The petals and anthers are dull yellow, the disk is greenish, and the fruit, green insofar as noted, measures up to 5 cm. in diameter and is obscurely 3-ridged distally. As far as specimens are dated, flowers have been obtained in October, fruits in October, November, and May.

TYPIFICATION: The type is *Smith 623* (GH HOLOTYPE; many ISOTYPES), collected Nov. 28, 1933, on the southwestern slope of Mt. Mbatini, Thakaundrove Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and predominantly from Vanua Levu, but also known from Viti Levu and Vanua Mbalavu.

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Near Queen's Road about 3 km. west of Veisari, *Vaughan 3336*. VANUA LEVU: MBUA: Rukuruku Bay, *H. B. R. Parham 4, 350, s. n.* (Jan., 1937); Koromba Forest, *DA 15123*. MATHUATA: Nakawanga, Mathuata Island, *Gressitt 2495*; vicinity of Lambasa, *Greenwood 502*;

FIGURE 163. A, *Salacia vitiensis*: distal portion of branchlet, with foliage and a detached fruit, $\times 1.2$. B, *Salacia pachycarpa*: distal portion of branchlet, with foliage and inflorescences, $\times 1.2$. C & D, *Salacia vitiensis*: C, cross section of fruit, with 5 seeds, $\times 2$; D, seeds, the lowest one with part of testa removed to show cotyledon, $\times 2$. A from *Smith 6497*, B from *Greenwood 1276*, C & D from *Smith 623*.

Mt. Numbuiloa, east of Lambasa, southern slopes, *Smith 6388*; same, summit ridge, *Smith 6497*. THAKAUNDROVE: Between Mbalanga and Valetih, Savusavu Bay, *Degener & Ordonez 14055*. VANUA LEVU without further locality, *H. B. R. Parham 22*. VANUA MBALAVU: Nambavatu, northern limestone section, *Tothill 72*. FIJI without further locality, *Horne 791, 1127*.

2. *Salacia pachycarpa* A. C. Sm. in *Sargentia* 1: 53. 1942, in *Bull. Torrey Bot. Club.* 70: 542. 1943, in *J. Arnold Arb.* 31: 290. 1950, in op. cit. 36: 281. 1955; *J. W. Parham, Pl. Fiji Isl.* 149. 1964, ed. 2. 214. 1972. FIGURES 163B, 164.

Liana, often high-climbing, occurring infrequently from near sea level to about 800 m. in often dense forest, sometimes on limestone. The petals and anthers are dull yellow, the filaments and disk pale green, and the fruit, insofar as noted, is green and up to 4.5 cm. in diameter, with dull orange seeds. Flowers have been collected in September and December, fruits between June and February.

TYPIIFICATION: The type is *Degener 15437* (A HOLOTYPE; ISOTYPES AT BISH, K, US), collected June 3, 1941, at Mataimeravula, vicinity of Rewasa, near Vaileka, Ra Province, Viti Levu.

DISTRIBUTION: Fiji and Tonga; in Fiji it is known only from Viti Levu and from a single Kandavu collection; in Tonga it has been collected on 'Eua (*Sykes 210/T, CHR 317145*), where it was also noted by G. P. Buelow (personal communication).

LOCAL NAMES: *Wasam* (type collection); *wa kau* (*Smith 5861*).

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 937*; Mt. Evans Range, *Greenwood 1276*; hills between Nggaliwana and Tumbendreketi Creeks, east of the sawmill at Navai, *Smith 5861*. NAMOSI: Hills bordering Wainavindrau Creek, vicinity of Wainimakutu, *Smith 8562a*. REWA: Near quarry west of Lami, on limestone rocks, *Gillespie 4581*. KANDAVU: Vicinity of Lutumatoro, *DA 14927*.

FAMILY 149. AQUIFOLIACEAE

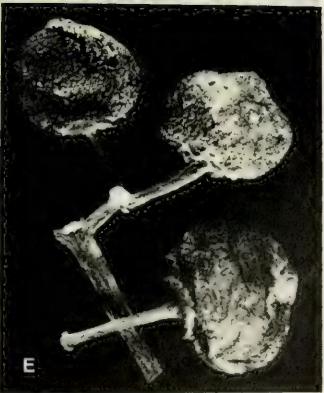
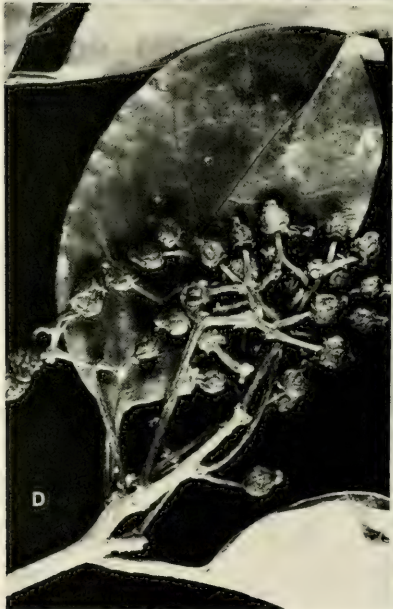
AQUIFOLIACEAE Bartling, *Ord. Nat. Pl.* 228, 376. 1830.

Trees or shrubs, estipulate or with small and usually caducous stipules; leaves alternate (rarely opposite), simple; inflorescences axillary or extra-axillary, cymose or fasciculate, rarely 1-flowered (infrequently racemose or paniculate or terminal); flowers small, actinomorphic, hypogynous, usually unisexual (infrequently ♂), basically 4- or 5-merous (but sometimes 6-9-merous); calyx deeply lobed, the lobes imbricate, rarely free to base; petals imbricate (in *Ilex*), rarely valvate, shortly connate proximally into a corolla (in *Ilex*) or free; stamens usually as many as petals and alternate with them (but flowers not always isomerous), the filaments usually adnate to base of corolla, the anthers 2-locular, dehiscent by longitudinal slits; disk lacking; ovary (2-)4-6(-8 or more)-locular, the ovules 1 (or 2) per locule (collateral if 2), pendulous from an axile placenta, anatropous, apotropous, unitegmic, the style short or none, the stigma lobed or capitate; fruits drupaceous, the pyrenes 1- or rarely 2-seeded, the seeds with a small embryo and abundant endosperm.

DISTRIBUTION: Cosmopolitan, with three-five genera (two of which are probably better referred to separate families) and 450-500 species, most of them referable to *Ilex*.

1. *ILEX* L. *Sp. Pl.* 125. 1753; *Seem. Fl. Vit.* 39. 1865; *Loesener in Engl. & Prantl, Nat. Pflanzenfam.* ed. 2. 20b: 53. 1942; *S. Y. Hu in J. Arnold Arb.* 30: 257. 1949; *Brizicky in op. cit.* 45: 228. 1964.

FIGURE 165. *Ilex vitiensis*; A, distal portion of branchlet, with foliage and young ♂ inflorescences, × 1/2; B, branchlet of ♂ inflorescence, × 4; C, ♂ flower with 7 stamens, × 6; D, developing infructescences, × 2; E, mature fruits, with persistent calyces and stigmas, × 4. A-C from *Smith 6817*, D from *Smith 776*, E from *Degener 14592*.



Dioecious trees or shrubs, the stipules minute, usually caducous; leaves alternate (rarely opposite), the blades entire to serrate or dentate; inflorescences solitary on current year's growth or clustered on second year's growth; flowers unisexual by abortion, heteromerous; calyx patelliform, the lobes 4-9, persistent; corolla rotate, the lobes 4-9, connate proximally (rarely distinct); stamens nearly as long as corolla lobes in ♂ flowers, short and sterile in ♀ flowers, the filaments ligulate or subulate, the anthers ovoid to ellipsoid, introrse, dorsifixed; ovary 4-9(-22)-locular (rudimentary in ♂ flowers), the ovules usually solitary, the stigma sessile or subsessile, capitate or discoid and mostly lobed, persistent in fruit; fruit a subglobose to ellipsoid, berrylike drupe, the exocarp membranaceous or chartaceous, the mesocarp fleshy, the pyrenes (usually 4-9) cuneate in cross section, the endocarp bony or ligneous.

LECTOTYPE SPECIES: *Ilex aquifolium* L. (vide Britton & Brown, Ill. Fl. N. U. S. ed. 2. 2: 486. 1913), one of the five original species.

DISTRIBUTION: Primarily pantropical but extending into temperate areas, with more than 400 species. *Ilex* occurs in several Melanesian and Polynesian archipelagoes, one species being endemic in Fiji.

1. *Ilex vitiensis* A. Gray, Bot. U. S. Expl. Exped. 1: 295. 1854, Atlas, pl. 25, A. 1856; Seem. in Bonplandia 9: 255. 1861, Viti, 434. 1862, Fl. Vit. 40. 1865, op. cit. 426. 1873; Drake, Ill. Fl. Ins. Mar. Pac. 138. 1890; Loesener in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20b: 58. 1942; J. W. Parham, Pl. Fiji Isl. ed. 2. 213. 1972.

FIGURE 165.

Tree (infrequently a shrub) 2-15 m. high, found at elevations of 100-950 m. in dense or dry forest and in ridge forest; petioles 6-20 mm. long, deeply canaliculate, the leaf blades thin-coriaceous, ovate to elliptic, (3.5-) 4-8.5 × (2-) 2.5-5.5 cm., rounded to obtuse at base, rounded to abruptly short-acuminate at apex, entire; inflorescences solitary toward ends of branchlets in leaf axils or extra-axillary, shorter than leaves, (1.5-) 2-4 cm. long and broad, the ♀ simpler and fewer-flowered than the ♂, the peduncles essentially none to 10 mm. long; flowers 4-8-merous, the pedicels 2-4 mm. long, the corolla 5-7 mm. in diameter, the petals white, oblong-elliptic, 2-3 × 1.5-2 mm.; stamens usually as many as petals, the filaments white, about 1 mm. long, the anthers yellow, 0.6-1 mm. long; ovary pale yellow; fruits deep red, becoming purple to black at maturity, subglobose or broadly ovoid, 5-7 mm. in diameter, the persistent stigma lobed and sessile, the pyrenes often about 8, deeply grooved dorsally. Flowering and fruiting material has been obtained between October and June.

TYPIFICATION: The species is based on *U. S. Expl. Exped.* (us 15828 HOLOTYPE), collected in 1840 at Mbua Bay, Mbua Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and now known from Viti Levu, Vanua Levu, and Taveuni. From presently known collections one could assume it to be fairly well dispersed on the two latter islands, but on Viti Levu it seems known only from higher areas of the northern and northwestern parts.

LOCAL NAMES: Names each recorded only once are *mutumutu* (Mbua), *rorombutho* (Mathuata), and *tele ni ndrano* (Taveuni).

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Natua Levu, Mt. Evans Range, *DA 14048*; vicinity of Nandarivatu, *Gillespie 4196.5*; Sovutawambu, near Nandarivatu, *Degener 14592*; Nandala, south of Nandarivatu, *O. & I. Degener 32045*; South Ridge, 8 km. west of Nandarivatu, *Webster & Hildreth 14268*. VANUA LEVU: MBUA: Southern portion of Seatovo Range, *Smith 1704*. MATHUATA: Seanggangga Plateau, in drainage of Korovuli River, vicinity of Natua, *Smith 6815, 6817, 6910*; Lingangoungou Forest, Natua, *DA 15340*; summit ridge of Mt. Numbuiloa, east of Lambasa, *Smith 6513*. THAKAUNDROVE: Vicinity of Korotasere, *DA 15498*; Mt. Uluingala, Natewa Peninsula, *Smith 1997*. TAVEUNI: *Seemann 87*; borders of lake east of Somosomo, *Smith 866, 869*; Mt. Manuka, east of Wairiki, *Smith 776*; track to Mt. Uluingala, *DA 14085*. FIJI without further locality, *Harvey s. n.*

In the system outlined by Loesener (1942), *Ilex vitiensis* falls into subgen. *Ilex* ("Euilex") ser. *Lioprinus* sect. *Excelsae* subsect. *Laxae*. The Malesian-Pacific species require a critical revision.

FAMILY 150. ICACINACEAE

ICACINACEAE Miers in Ann. Mag. Nat. Hist. II. 8: 174. 1851.

Trees, shrubs (sometimes scandent), or lianas, estipulate; leaves alternate (rarely opposite), simple, the blades entire or occasionally sinuate-dentate; inflorescences usually axillary (sometimes terminal) or borne on old wood, cymose or spiciform-racemose, sometimes paniculiform, rarely fasciculate or 1-flowered, bracteate; flowers ♂ or functionally unisexual (and plants dioecious or polygamodioecious), actinomorphic, hypogynous, (3 or)4- or 5(or 6)-merous, sessile or pedicellate, articulated below calyx; calyx small, usually deeply lobed, the lobes usually imbricate and persistent, not accrescent; petals (rarely lacking) free or proximally connate into a tube with valvate or rarely subimbricate lobes, apically inflexed; stamens as many as sepals or petals, antepetalous, the filaments subulate or filiform, often pilose distally with clavate, subglandular hairs, the anthers 2-locular, basifixed, latrorse or introrse, usually dehiscing by longitudinal slits; disk absent or infrequently present and small, then annular or cupuliform, sometimes adnate to ovary or reduced to a unilateral scale; ovary free, usually functionally unilocular (only 1 locule fully developed and ovuliferous), the ovules (1 or) 2, apical, pendulous, usually collateral, anatropous, apotropous, unitegmic, the style short or lacking, the stigma punctiform to lobed or subcapitate; fruit drupaceous, ellipsoid to globose, symmetrical or flattened, the exocarp usually thin-carnose, the endocarp crustaceous to ligneous or fibrous, often variously veined or reticulate without, smooth or tuberculate within, the seed 1, exarillate, the endosperm abundant, the embryo straight.

DISTRIBUTION: Pantropical and subtropical, occasionally extending into temperate areas, with about 56 genera and 300-400 species. Two genera are indigenous in Fiji, each with a single endemic species.

USEFUL TREATMENTS OF FAMILY: SLEUMER, H. *ICACINACEAE*. Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20b: 322-396. 1942. SLEUMER, H. *ICACINACEAE*. Fl. Males. I. 7: 1-87. 1971.

KEY TO GENERA

- Inflorescences in our species terminal and narrowly paniculate, with short lateral cymules, the flowers sessile, ♂; calyx lobed at least to middle; filaments glabrous; drupe of our species ovoid- to obovoid-oblong, drying ridged and strongly rugulose. 1. *Citronella*
 Inflorescences axillary, cymose, the flowers short-pedicellate, functionally unisexual (plants dioecious); calyx cupuliform, obscurely dentate; filaments of ♂ flowers conspicuously pilose distally with clavate hairs; drupe laterally compressed or curved, the concave surface with a large pulvinus, the convex surface (1-)3-5-ridged. 2. *Medusanthera*

1. CITRONELLA D. Don in Edinburgh New Philos. J. 13: 243. 1832; R. Howard in Contr. Gray Herb. 142: 61. 1942; Sleumer in Blumea 17: 186. 1969, in Fl. Males. I. 7: 4. 1971.

Trees or shrubs, occasionally scandent; leaves alternate, the blades coriaceous to submembranaceous, entire to spinulose-dentate, with arcuate, anastomosing nerves; inflorescences paniculate or thyrsoid; flowers ♂ or unisexual, sessile, 5-merous; calyx imbricately lobed about to middle or more deeply; petals free, carnose, valvate to proximally subimbricate, the midrib prominent within; stamens free, shorter than petals, the filaments glabrous, fleshy, subulate and somewhat flattened, the anthers ellipsoid to ovoid, subcordate at base, introrse; disk lacking; ovary subgibbous, the locule with a parietal ridge, the ovules 2, the style slender, the stigma small, capitate, rugose; drupe with a woody but thin endocarp, the locule incompletely septate, the seed hipocrepiform, longitudinally plicate around the vertical, woody dissepiment.

TYPE SPECIES: *Citronella mucronata* (Ruiz & Pavón) D. Don (*Villaresia mucronata* Ruiz & Pavón); *Citronella* is a substitute name for *Villaresia* Ruiz & Pavón (1802), nec id. (1794).

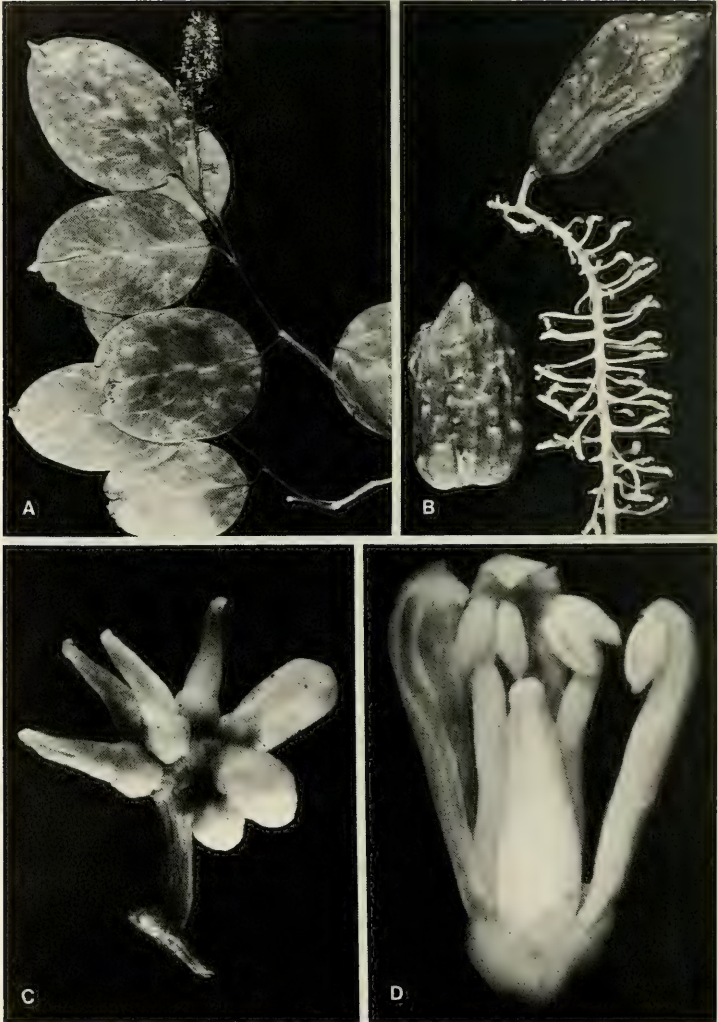


FIGURE 166. *Citronella vitiensis*; A, distal portion of branchlet, with foliage and an inflorescence, $\times 1/3$; B, distal portion of infructescence and fruits, $\times 1$; C, lateral cymule of inflorescence, $\times 6$; D, flower, with 2 petals and 2 stamens removed, $\times 14$. A, C, & D from DA 3802, B from Smith 7629 (detached fruit from Gillespie 4511).

DISTRIBUTION: Central and South America, and in the paleotropics from Malesia and eastern Australia into the Pacific to Tonga and Samoa, with about 21 species. One endemic species occurs in Fiji.

USEFUL TREATMENT OF GENUS: HOWARD, R. A. Studies of the Icacinaceae V. A revision of the genus *Citronella* D. Don. Contr. Gray Herb. **142:** 60-89. 1942.

1. *Citronella vitiensis* R. Howard in *Sargentia* **1:** 53. fig. 3. (July 20) 1942, in Contr. Gray Herb. **142:** 84. (Sept. 10) 1942, in *J. Arnold Arb.* **31:** 291. 1950; J. W. Parham, Pl. Fiji Isl. **149.** 1964, ed. 2. 213. 1972. FIGURE 166.

Tree 4-15 m. high, occasional (sometimes locally frequent) in dense or secondary forest and sometimes along streams at elevations of about 30-1,000 m.; petioles 1-1.5 cm. long; leaf blades coriaceous, ovate or elliptic, 6-17 × 4-12 cm., entire, obtuse to subcordate at base, with a blunt acumen 5-10 mm. long, the secondary nerves 4-6 per side; inflorescence terminal, narrowly paniculate, 8-19 cm. long, the lateral cymes to 1 cm. long, each with several subcapitate-congested or scorpioid, fragrant ♀ flowers; petals greenish yellow or white, oblong, thick, about 5 × 1-1.4 mm.; stamens with thick, white filaments 3.3-4 mm. long, the anthers 1-1.2 mm. long; gynoecium ovoid, attenuate, about 3.5 mm. long at anthesis; drupe green, becoming black, ovoid- to obovoid-oblong, drying ridged and strongly rugulose, at maturity 3-4.7 × 1.5-2.2 cm., truncate or subcordate at base, narrowed toward apex. Flowers have been obtained between September and January, fruits in every month between May and January.

TIPIFICATION: The type is *Degener & Ordonez 14007* (A HOLOTYPE; ISOTYPES at BISH, K, US), collected between Dec. 26, 1940, and Jan. 10, 1941, on Mt. Vatunivua-monde, Savusavu Bay region, Thakaundrove Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and known only from Viti Levu, Ovalau, and Vanua Levu; 26 collections have been examined. The species seems reasonably frequent only in north-central and southeastern Viti Levu.

LOCAL NAME: The name *nunga* (*nungga?*) has been recorded in Naitasiri.

REPRESENTATIVE COLLECTIONS: VITI LEVU: Mba: Hills between Nandala and Nukunuku Creeks, along trail from Nandarivatu toward Lewa, *Smith 6205*; vicinity of Nandarivatu, *Gillespie 3384*; Mt. Nanggaranambuluta, east of Nandarivatu, *Greenwood 876*. NADRONGA & NAVOSA-NAMOSI boundary area: Ridge between Navua and Singatoka Rivers, *DA 2468*. NAITASIRI: Tholo-i-suva, *DA 3802*; source of Nasinu River, south of Tholo-i-suva, *Vaughan 3299*; vicinity of Nasinu, *Gillespie 3590*. OVALAU: Hills west of Lovoni Valley, on ridge south of Mt. Korolevu, *Smith 7629*; vicinity of Levuka, *Gillespie 4511*.

From its Malesian-Pacific congeners, *Citronella vitiensis* is readily distinguished by its large, prismatic, ridged drupes, about twice as long as broad, with the endocarp rugulose and strongly angled.

2. *MEDUSANTHERA* Seem. in *J. Bot.* **2:** 74. 1864; R. Howard in *J. Arnold Arb.* **21:** 469. 1940; Sleumer in Engl. & Prantl, *Nat. Pflanzenfam.* ed. 2. **20b:** 362. 1942; R. Howard in *Lloydia* **6:** 133. 1943; Sleumer in *Blumea* **17:** 226. 1969, in *Fl. Males. I.* **7:** 45. 1971.

Stemonurus sensu Seem. *Fl. Vit.* 39, p. p. 1865; non Bl.

Tylecarpus Engl. in Engl. & Prantl, *Nat. Pflanzenfam.* III. 5: 247. 1893.

Diocious trees, without stipules; leaves alternate, the blades entire, pinnate-nerved, the nerves usually anastomosing; inflorescences axillary, with 1-3-pedunculate, 3- or 4-times branched cymes, the pedicels short; flowers unisexual, 5-merous; calyx cupuliform, obscurely dentate; petals free, valvate, lanceolate-oblong; stamens in ♂ flowers with filaments flattened, fleshy, abruptly narrowed at apex, bearing clavate hairs distally (in ♀ flowers often glabrous), the anthers ellipsoid-oblong, introrsely dehiscent (sterile in ♀ flowers); disk lacking; ovary cylindrical (rudimentary in ♂ flowers), glabrous, with a pulviniform, lateral swelling near base,

1-locular, the style inconspicuous or none, the stigma capitate, 3-5-lobed; drupe ellipsoid to oblong or distally narrowed, rounded or truncate at base and apex, laterally compressed or curved, the concave surface with a large, fleshy, pulviniform appendage, the convex surface (1-)3-5-ridged, the endocarp thin, with a broad, deep groove on the concave surface, ridged on the convex surface.

TYPE SPECIES: *Medusanthera vitiensis* Seem., the only original species; the type species of *Tylecarpus* is *T. papuanus* (Becc.) Engl. (*Lasianthera papuana* Becc.), = *Medusanthera papuana* (Becc.) R. Howard.

DISTRIBUTION: Malesia into the Pacific to the Caroline Islands, Fiji, and Samoa, with about ten species; the genus is also noted from the Andaman and Nicobar Islands by Airy Shaw (in Willis, Dict. Fl. Pl. Ferns. ed. 7. 705. 1966). One endemic species is present in Fiji.

USEFUL TREATMENT OF GENUS: HOWARD, R. A. Studies of the Icacinaceae. VII. A revision of the genus *Medusanthera* Seemann. *Lloydia* 6: 133-143. 1943.

1. *Medusanthera vitiensis* Seem. in *J. Bot.* 2: 74. 1864; R. Howard in *J. Arnold Arb.* 21: 469. 1940; Sleumer in *Engl. & Prantl, Nat. Pflanzenfam.* ed. 2. 20b: 363. 1942; R. Howard in *Lloydia* 6: 139. 1943, in *J. Arnold Arb.* 31: 291. 1950; J. W. Parham, *Pl. Fiji Isl.* 149. 1964, ed. 2. 213. 1972. FIGURE 167.

Stemonurus sp. Seem. in *Bonplandia* 10: 296. 1862, Viti, 434. 1862.

Stemonurus vitiensis Seem. *Fl. Vit.* 39. t. 12. 1865.

Lasianthera vitiensis Seem. *Fl. Vit.* 426. 1873; Becc. *Malesia* 1: 108. 1877; Drake, *Ill. Fl. Ins. Mar. Pac.* 137. 1890.

Gomphandra vitiensis Valetton, *Crit. Overz. Olac.* 230. 1886.

An often slender tree 2-20 m. high, sometimes with short lateral branches, occurring from near sea level to about 1,150 m. in dense, dry, or secondary forest; petioles 6-22 mm. long; leaf blades thin-coriaceous to papyraceous, ovate to ovate-oblong or elliptic, 6-15 × 2.5-9 cm., rounded to obtuse at base, somewhat obtuse to obviously acuminate at apex, the principal lateral nerves 6-10 per side, spreading, arcuate toward margin; inflorescences 3-4.5 cm. long, with peduncles 1-2 cm. long; calyx pale green, cupuliform; petals white to pale green, oblong, 3-3.5 × 1-2 mm., glabrous; fertile stamens about as long as petals, the filaments greenish white or pale green, with copious hairs 1-2 mm. long, the anthers pale yellow, about 1 mm. long; functional ovary pale green, cylindrical, about 3 mm. long, the stigma capitate; drupe green, becoming black at maturity, with a white pulvinus, oblong, tapering to a blunt, recurved apex, 14-32 × 6-18 mm., the endocarp 3-ridged on convex surface. Flowers have been obtained between June and December, fruits between July and January.

TYPIFICATION: The species is based on *Storck 877* (K HOLOTYPE; ISOTYPE at GH), collected in December, 1860, near Mbureta, Ovalau.

DISTRIBUTION: Endemic to Fiji; nowhere abundant or conspicuous, but now known from 32 collections from five of the high islands.

LOCAL NAMES: Recorded names have been *lere* (Mba) and *nduvu* (Serua, Naitasiri, and Ovalau).

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mt. Ndelaiyoo, on escarpment west of Nandarivatu, *Smith 5054*; vicinity of Nandarivatu, *Gillespie 3990*; western and southern slopes of Mt. Tomanivi, *Smith 5280*. SERUA: Inland from Navutulevu, *DF 234 (Bola 82)*; hills east of Navua River, near Nukusere, *Smith 9089*. NAMOSI: Mt. Naitarandamu, *Gillespie 3362*; hills east of Wainikoroiuva River, near Namuamua, *Smith 9037*. NAITASIRE: Toninaiwau, Tholo-i-suva, *DA 16203*. TAILEVU: Near Copper Mine, Waimaro River, *DA 13633*. REWA: Vicinity of Lami, *Meebold 17028*. OVALAU: Nasonggo, Lovoni Valley, *DA 13284*. NGAU: Hills east of Herald Bay, inland from Sawaieke, *Smith 7750*. VANUA LEVU: MATHUATA: Vicinity of Lambasa, *DF 247 (Bola 95)*. THAKAUNDRIVE: Hills between Vatukawa and Wainio Rivers, Ndrekeniwai Valley, *Smith 578*; near Nambua Village, on Tambia road, *DA 17100*. TAVEUNI: Wainisavu, vicinity of Nggeleni, *DA 14400*.

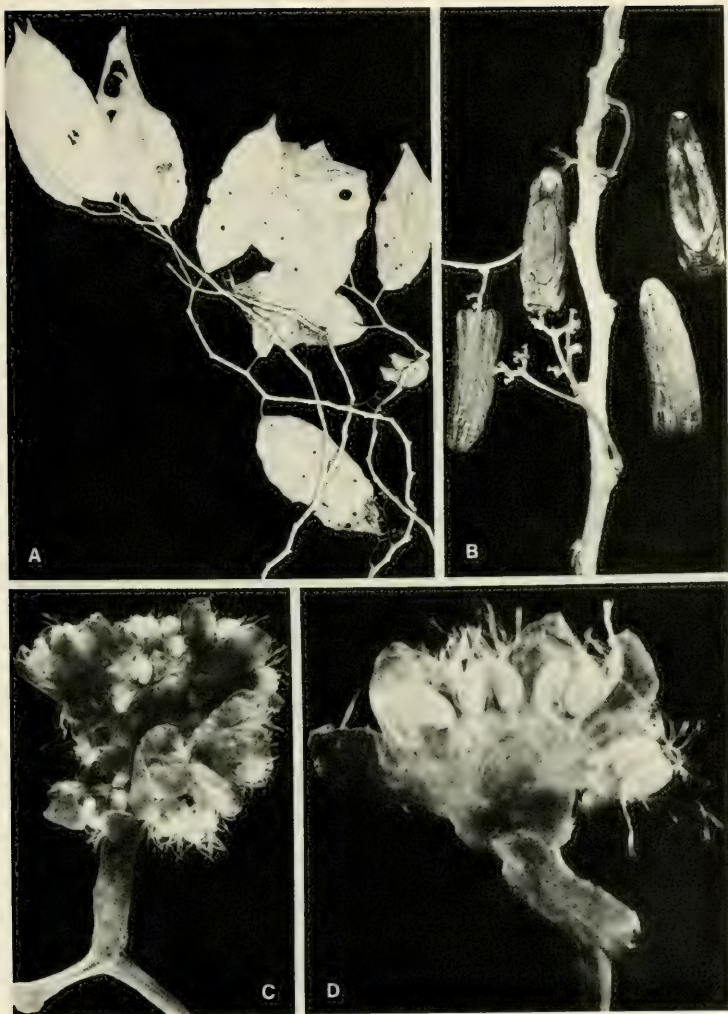


FIGURE 167. *Medusanthera vitiensis*: A, distal portions of branchlets, with inflorescences, $\times 1/3$; B, inflorescences and fruits, the 2 uppermost ones showing concave surfaces with pulviniform appendages, the 2 lowermost ones showing convex surfaces, $\times 1$; C, ultimate cymule of σ flowers, $\times 4$; D, σ flower, with 1 petal and 1 stamen removed, $\times 10$. A from DA 16203, B from Smith 5280, C & D from Smith 7750.

FAMILY 151. DICHAPETALACEAE

DICHAPETALACEAE Baill. in Mart. Fl. Bras. 12 (1): 365, as *Dichapetaleae*. 1886. Nom. cons.

Chaillietiaceae R. Br. in Tuckey, Narr. Exped. Congo, Append. 5: 442, as *Chailleteae*. 1818.

Small trees, shrubs, or lianas, with usually caducous stipules; leaves alternate, simple, the blades entire, pinnately nerved; inflorescences axillary (sometimes epiphyllous), cymose or glomerulate or paniculate; flowers small, ♂ or unisexual, hypogynous to epigynous, actinomorphic or slightly zygomorphic, (4- or)5-merous, the pedicels often articulated; sepals free or partially connate, imbricate; petals mostly emarginate, 2-lobed, or 2-parted, often drying black, free (in our genus) or united with stamens into a tube; disk present, often composed of glands opposite petals or confluent; stamens alternate with petals or corolla lobes, sometimes only 3 fertile and 2 staminodial, the filaments usually filiform, the anthers narrowly oblong-ovate, introrse, 2-locular, dehiscent lengthwise, the connective often dorsally thickened; ovary superior to inferior, 2- or 3-locular, the ovules 2 per locule, anatropous, bitegmic, pendulous from apex, the styles 2 or 3, free or connate nearly to apex, the stigmas small, capitate or simple; fruit an ellipsoid or obovoid drupe, 1-3-lobed, 1-3-locular, usually pubescent, the locules often compressed, dry or rarely fleshy, the exocarp sometimes splitting, each locule 1-seeded, the seeds without endosperm, sometimes carunculate, the embryo large, straight.

DISTRIBUTION: Pantropical and subtropical, with three-five genera and 200-250 species. The only paleotropical genus is *Dichapetalum*, extending eastward to Tonga.

USEFUL TREATMENTS OF FAMILY: ENGLER, A., & K. KRAUSE. Dichapetalaceae. Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19c: 1-11. 1931. HUTCHINSON, J. Dichapetalaceae. Gen. Fl. Pl. 1: 216-219. 1964. PRANCE, G. T. A monograph of the neotropical Dichapetalaceae. Fl. Neotropica 10: 3-84. 1972.

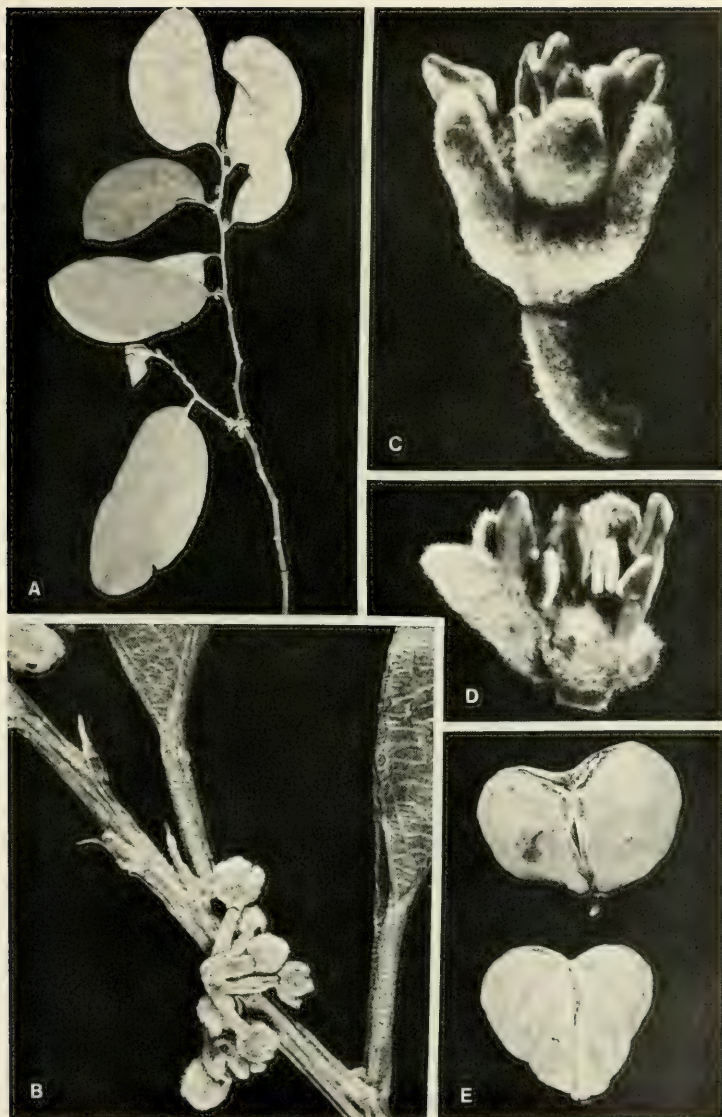
Prance (1972, pp. 5-6) has well discussed prior placements of the Dichapetalaceae as a member of the orders Euphorbiales, Thymelaeales, Rosales, and Polygalales, concluding that its most natural position is in the order Celastrales, in which it seems a comparatively advanced member suggesting certain genera of Icacinaceae. This position for the family has also been adopted by Cronquist (1968, 1981).

1. DICHAPETALUM Thou. Gen. Nova Madagasc. 23. 1806; Engl. & Krause in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 19c: 5. 1931; Leenh. in Reinwardtia 4: 75. 1956, in Fl. Males. I. 5: 305. 1957; Hutchinson, Gen. Fl. Pl. 1: 218. 1964; Prance in Fl. Neotropica 10: 16. 1972.

Chaillitia DC. in Nouv. Bull. Sci. Soc. Philom. Paris 2: 205. 1811, in Ann. Mus. Hist. Nat. (Paris) 17: 158. 1811; Seem. Fl. Vit. 38. 1865.

Characters of the family; often monoecious or dioecious; leaf blades usually with orbicular, flat glands on lower surface between nerves, the margin slightly thickened; inflorescences axillary or extra-axillary (as in our species), less often adnate to petiole, the pedicels articulated near apex; flowers hypogynous (as in our species) or slightly epigynous, ♂ or unisexual (as in our species); petals free to base, usually bicucullate and 2-lobed at apex, the lobes with inflexed margins; disk composed of 5 small glands, these entire or shallowly lobed, free (as in our species) or united; stamens all fertile in ♂ flowers, the filaments free; ovary free or rarely adnate to receptacle, subglobose (rudimentary in ♂ flowers); drupe dry, indehiscent or the angles sometimes (as in our species) with sutures exposing the mesocarp, the pericarp thin, fleshy, the endocarp crustaceous, the pyrenes 1-3.

FIGURE 168. *Dichapetalum vitiense*: A, distal portion of branchlet, with foliage and inflorescences, × 1/3; B, young ♂ inflorescence, also showing petioles, lower surfaces of leaf blades, and stipules, × 4; C, ♂ flower, × 10; D, ♂ flower, with 2 sepals, 2 petals, and 2 stamens removed, × 10; E, fruits, the upper with 2 maturing locules, the lower with 3 maturing locules, × 1. A from Gillespie 3510, B-D from Smith 6504, E from Parks 20950 (upper) and Smith 7154 (lower).



TYPE SPECIES: *Dichapetalum madagascariense* Poir.; the lectotype species of *Chailletia* is *C. pedunculata* DC. (vide DC. Prodr. 2: 58. 1825).

DISTRIBUTION: Pantropical, with 150–200 species. The paleotropical portion of the range extends eastward to Fiji and Tonga, where a single species is found.

USEFUL TREATMENTS OF GENUS: LEENHOUTS, P. W. *Florae Malesianae Praecursores XII*. Some notes on the genus *Dichapetalum* (*Dichapetalaceae*) in Asia, Australia, and Melanesia. *Reinwardtia* 4: 75–87. 1956. LEENHOUTS, P. W. *Dichapetalum*. *Fl. Males.* 1. 5: 305–316. 1957.

1. *Dichapetalum vitiense* (Seem.) Engl. in Engl. & Prantl, *Nat. Pflanzenfam.* III. 4: 348. 1896; Engl. & Krause in op. cit. ed. 2. 19c: 6. 1931; Leenh. in *Reinwardtia* 4: 86. 1956; Yuncker in *Bishop Mus. Bull.* 220: 159. 1959; J. W. Parham, *Pl. Fiji Isl.* 62. 1964, ed. 2. 95. 1972. FIGURE 168.

Chailletia vitiensis Seem. in *Bonplandia* 10: 296, nom. nud. 1862, Viti, 434, nom. nud. 1862, *Fl. Vit.* 38. 1865; Drake, *Ill. Fl. Ins. Mar. Pac.* 137. 1890.

Diocious liana, often high-climbing, found from near sea level to 900 m. in dense forest or in forest patches in open country, rarely on the inner edges of mangrove swamps; branchlets and petioles ferruginous-strigose, tardily glabrate; stipules lanceolate, 2–5 mm. long, caducous; petioles 5–10 mm. long; leaf blades chartaceous to subcoriaceous, elliptic-oblong to lanceolate, (4–) 6–15 × (1.5–) 2.5–6.5 cm., inaequilaterally obtuse at base, obtuse to obtusely short-acuminate at apex, sparsely to copiously soft-pilose beneath, at length glabrate, with often obscure glands beneath, the secondary nerves 6–8 per side, curved and anastomosing toward margin; inflorescences compact, 0.5–1 cm. long, short-pedunculate, dichotomously branched, 6–15-flowered, the branchlets, pedicels, and calyx with a copious, pale brown indument, the pedicels 3–5 mm. long; calyx 3–4 mm. long; petals cream-white to dull yellowish, elliptic, 2.5–3 × 1–1.5 mm., conspicuously bilobed; disk lobes inconspicuous, 0.2–0.4 mm. long; functional stamens with filaments 0.7–1 mm. long, the anthers cream-white, about 1 mm. long; drupe solitary, tawny greenish without, with copious, brown, tomentose indument, obovoid, 2–3 × 1.5–4 cm., often 3-lobed, sometimes 2-lobed, rarely 1-lobed, the pericarp thick-coriaceous, the sutures conspicuous, eventually splitting to disclose the red mesocarp, the pyrenes obovoid, to 2 × 1.5 cm., with a strongly rugose endocarp. Flowers and fruits have been observed throughout the year.

TYPIFICATION: In 1865 Seemann listed two specimens, *Storck 876*, from Ovalau, and *Milne*, from Ngau. Of these, Leenhouts (1956) indicated the former (κ) as LECTOTYPE, appropriately since this was the specimen listed by Seemann in 1862, before the species was formally described. The Ngau specimen is *Milne 157* (κ).

DISTRIBUTION: Fiji and Tonga; occasional in Fiji, from which 36 collections from five islands (including one in the Lau Group) have been examined. In Tonga the species seems infrequent, known to me only from Vava'u and 'Eua.

LOCAL NAME: The name *wa ramende* was recorded from Mathuata.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Northern portion of Mt. Evans Range, between Mt. Vatuyanitu and Mt. Natondra, *Smith 4385*; Matathawa road, west of Tavua, *O. & I. Degener 32087*; vicinity of Nandarivatu, *Gillespie 4041*. SERUA: Inland from Namboutini, *DA 14265*; 8 km. north of Ngaloa, *Webster & Hildreth 14337*. NAMOSI: Vicinity of Namuamua, *Gillespie 3039*. NAITASIRI: Central road, *Tothill 530*; vicinity of Nasinu, *Gillespie 3510*. NAITASIRI-REWA boundary: Mt. Kombalevu, *Parks 20314*. TAILLEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7154*. REWA: Queen's Road about 3 km. west of Veisari, *Vaughan 3307*. VITI LEVU without further locality, *Parks 20950*. VANUA LEVU: MATHUATA: Summit ridge of Mt. Numbuiloa, east of Lambasa, *Smith 6504*; Mathuata coast and vicinity of Lambasa, *Greenwood 509*. THAKAUNDROVE: Mt. Kasi, Yanawai River region, *Smith 1831*; between Mbalanga and Valethi, Savusavu Bay, *Degener & Ordonez 14045*. ONEATA: *Graeffe 1380*.

Dichapetalum vitiense seems most closely related (Leenhouts, 1956) to *D. gelonioides* (Roxb.) Engl., a widespread species from southeastern Asia to Borneo and the Philippines, differing in having its leaf blades inaequilateral at base and soft-pilose beneath and in its substantially larger fruits.

ORDER RHAMNALES

KEY TO FAMILIES

Flowers shortly perigynous to nearly epigynous, the petals often smaller than calyx lobes; disk usually conspicuous, intrastaminal; ovules usually solitary in each ovary locule; fruit usually a drupe, sometimes a schizocarp or capsule, not baccate; leaves simple; inflorescences terminal or axillary.

152. RHAMNACEAE

Flowers hypogynous, the petals obvious, larger than calyx lobes; fruit baccate; leaves sometimes simple but often compound; inflorescences often leaf-opposed, sometimes terminal, infrequently axillary.

Petals free or basally connate but not adnate to androecium; filaments free, the anthers introrse at anthesis; disk intrastaminal, annular, cupuliform, or composed of free glands; ovules usually paired in each ovary locule; usually woody vines with tendrils. 153. VITACEAE

Petals adnate to androecium to form a shortly tubular common structure; filaments connate into a conspicuous, lobed, staminodial tube, the antheriferous filaments inserted outside staminodial tube and attached to anthers over its sinuses, the anthers syngenesious and often remaining so within staminodial tube, introrse as so inverted; nectariferous disk lacking (the staminodial tube apparently not to be so interpreted); ovules solitary in each ovary locule; usually trees or shrubs, without tendrils.

154. LEEACEAE

FAMILY 152. RHAMNACEAE

RHAMNACEAE Juss. Gen. Pl. 376, as *Rhamni*. 1789.

Trees, shrubs, or lianas, rarely herbs, sometimes monoecious or polygamodioecious, sometimes with coiled tendrils or hooks, usually stipulate, the stipules small, sometimes modified into spines; leaves alternate or less often opposite, simple, the blades pinnately nerved or with several principal nerves from base; inflorescences terminal or axillary, predominantly cymose or paniculiform or racemiform, sometimes fasciculate, rarely 1-flowered; flowers small, actinomorphic, mostly ♂, rarely unisexual by abortion, 4- or 5-merous, haplostemonous, shortly perigynous to nearly epigynous; calyx cyathiform or infundibular, the lobes valvate, longitudinally keeled within, usually deciduous; petals often minute, often clawed, commonly concave or hooded, rarely lacking; stamens opposite petals and often embraced by them, the filaments adnate to petal bases, the anthers 2-locular, introrse, dehiscent by longitudinal clefts; disk usually conspicuous, intrastaminal, lining or sometimes nearly filling calyx tube; ovary free or partially or completely surrounded by disk, 2- or 3(-5)-locular, the ovules usually solitary (rarely 2) and erect in each locule, anatropous, bitegmic, the style lobed to deeply divided; fruit usually a drupe, sometimes a schizocarp or capsule, dehiscent or indehiscent, the embryo large, the endosperm copious or scanty.

DISTRIBUTION: Cosmopolitan, but mostly tropical and subtropical, with about 55 genera and 900 species. Nine genera are recorded in Fiji, seven of them with indigenous species.

USEFUL TREATMENTS OF FAMILY: SUESSENGUTH, K. *Rhamnaceae*. Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20d: 7-173. 1953. BRIZICKY, G. K. The genera of Rhamnaceae in the southeastern United States. *J. Arnold Arb.* 45: 439-463. 1964.

KEY TO GENERA

Fruit without longitudinal wings and without a terminal wing or a dorsiventrally flattened apex; ovary superior to half inferior.

Endocarp crustaceous or leathery or cartilaginous, separating regularly into 3 dry endocarps dehiscent along the ventral (and sometimes partially down the dorsal) suture; fruit a partially inferior drupe; indigenous taxa.

Inflorescence a compact, sessile or short-pedunculate, few-flowered, axillary cyme or small thyrse; endocarp thin-crustaceous or cartilaginous. 1. *Colubrina*

Inflorescence a terminal or axillary, freely branched, obviously pedunculate, many-flowered thyrse. Exocarp thin and leathery. 2. *Emmenosperma*

Exocarp thick, spongy and crumbling at maturity. 3. *Alphitonia*

Endocarp bony, not separating into endocarps; fruit a fleshy drupe, superior, indehiscent. Branchlets with recurved stipular thorns; leaf blades with 3 or 5 conspicuous nerves ascending from base; cultivated or naturalized taxa.

- Fruit depressed-subglobose, with a broad horizontal wing spreading from near middle, 2- or 3-locular, each locule with a single seed. 4. *Paliurus*
- Fruit unwinged, often with a solitary seed. 5. *Ziziphus*
- Branchlets without stipular thorns; leaf blades with pinnate venation; fruit an ellipsoid or narrowly obovoid, unwinged drupe; indigenous. 6. *Rhamnella*
- Fruit longitudinally or apically winged or with a dorsiventrally flattened apex; indigenous taxa.
- Ovary superior to partially inferior; disk lacking lobes opposite calyx segments; fruit with a winged or dorsiventrally flattened apex; scandent shrubs or lianas, but without tendrils.
- Fruit an indehiscent drupe with an apical wing much longer than the seminiferous part and sharply differentiated from it. 7. *Ventilago*
- Fruit a 2-valved, dorsiventrally flattened-ovoid capsule, dehiscent, with an empty apex only slightly longer than the seminiferous part and not sharply differentiated from it. 8. *Smythea*
- Ovary inferior; disk with an oblong lobe opposite each calyx segment; fruit a longitudinally (rarely 4)-winged schizocarp, splitting septically through each wing into 2-winged mericarps; shrubs or lianas, the branchlets often tendrillous. 9. *Gouania*

1. *COLUBRINA* L. C. Rich. ex Brongn. Mém. Fam. Rham. 61. 1826, in Ann. Sci. Nat. **10**: 368. 1827; Seem. Fl. Vit. 42. 1865; Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **20d**: 85. 1953; Brizicky in J. Arnold Arb. **45**: 455. 1964; M. Johnston in Brittonia **23**: 7. 1971. Nom. cons.

Unarmed or spinescent shrubs, often scandent, the leaves alternate or opposite; inflorescences compact, sessile or short-pedunculate, few-flowered, axillary cymes or small thyrses; flowers ♂ (rarely some ♂), the calyx tube cupular or hemispherical, the lobes 5, deltoid; petals narrowly cucullate; stamens about as long as petals; disk nearly filling calyx tube and at first concealing ovary, accrescent and adnate to lower portion of fruit; ovary semi-inferior, 3-locular, the style slender, 3-lobed, the stigmas small, obtuse; fruit a subglobose, shallowly 3-lobed drupe suffused at base by adnate remnants of calyx tube and disk, the mesocarp dry, loosely adherent to endocarp at maturity, the endocarp crustaceous, separating into 3 endocarps dehiscing along the ventral (and sometimes partially along the dorsal) suture, the single seed of each strongly convex dorsally.

TYPE SPECIES: *Colubrina ferruginosa* Brongn. (*Rhamnus colubrinus* Jacq.), typ. cons., = *C. arborescens* (Mill.) Sarg. The original 1826 reference is that indicated by Brizicky (1964) and Johnston (1971); it refers to a preprint, published earlier than the journal (1827) and with different pagination. ING (1979) lists only the 1827 reference.

DISTRIBUTION: Tropical and subtropical America, and in the Old World from eastern Africa and Indian Ocean islands to southeastern Asia, Malesia, and tropical Australia, eastward in the Pacific to the Tuamotus and Hawaii. Thirty-one species are recognized in Johnston's 1971 revision. One widespread species is abundant in Fiji.

USEFUL TREATMENT OF GENUS: JOHNSTON, M. C. Revision of *Colubrina* (Rhamnaceae). Brittonia **23**: 2-53. 1971.

1. *Colubrina asiatica* (L.) Brongn. Mém. Fam. Rham. 62. 1826, in Ann. Sci. Nat. **10**: 369. 1827; A. Gray, Bot. U. S. Expl. Exped. **1**: 277. 1854; Seem. in Bonplandia **9**: 255. 1861, Viti, 434. 1862, Fl. Vit. 42. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 140. 1890; Guppy, Obs. Nat. Pac. **2**: 137. 1906; Guillaumin in J. Arnold Arb. **12**: 239. 1931; Christophersen in Bishop Mus. Bull. **128**: 133. 1935; Yuncker in op. cit. **178**: 79. 1943, in op. cit. **184**: 49. 1945, in op. cit. **220**: 177. 1959; J. W. Parham in Dept. Agr. Fiji Bull. **35**: 97. 1959, Pl. Fiji Isl. 153. 1964, ed. 2. 218. 1972; Brizicky in J. Arnold Arb. **45**: 456. 1964; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 173. 1970; M. Johnston in Brittonia **23**: 46. 1971; St. John & A. C. Sm. in Pacific Sci. **25**: 332. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 33. 1972.

FIGURES 92 (upper), 169E.

Ceanothus asiaticus L. Sp. Pl. 196. 1753.

Ceanothus capsularis Forst. f. Fl. Ins. Austr. Prodr. 18. 1786.

As seen in Fiji, *Colubrina asiatica* is often abundant from near sea level to about 450 m. in thickets (often those near beaches), along rocky coasts, and in dry forest along streams inland, as a scrambling or scandent shrub or small tree 1–10 m. high or as a liana. Its leaf blades are usually less than 11×6.5 cm., its compact inflorescences have peduncles less than 3 mm. long, and its fruits measure less than 1 cm. in diameter. The calyx lobes and petals vary from white to pale or dull yellow, the disk and stamens are pale or greenish yellow, the fruits are green and at length brownish, and the seeds are pale yellow-brown. Flowers and fruits seem to occur throughout the year.

TYPIFICATION AND NOMENCLATURE: The only reference given by Linnaeus in 1753 was *Flora Zeylanica*, 98 (1747), and the type therefore is *Hermann* (BM HOLOTYPE, Herb. 2.11), indicated as the lectotype by Johnston (1971). *Ceanothus capsularis* is based on J. R. & G. Forster (BM HOLOTYPE), from Tahiti; this name has appeared in the Fijian literature only as Seemann (1865) correctly listed it as a synonym. All the Pacific material falls into var. *asiatica*, but Johnston (1971) discusses a second variety occurring from Burma and Yunnan to Java.

DISTRIBUTION: Eastern Africa, Indian Ocean islands, and southeastern Asia through Malaysia to Australia and Pacific islands eastward to the Tuamotus and Hawaii; also naturalized in the Caribbean and southern Florida. Guppy (1906) indicates that the seeds of *Colubrina asiatica* may float unharmed in seawater for many months. About 45 Fijian collections, from twelve islands, are at hand, but the species may be expected along most coasts.

LOCAL NAMES AND USES: Although *vere* and *vusolevu* are the usual names, the following have also been recorded: *verevere*, *verelailai*, *matandra*, *asiasi*, and *sili*. The root is somewhat soapy and was formerly used for washing, and the species is sometimes used as part of an internal remedy for headaches.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Yalombi, *St. John 18031*. VITI LEVU: MBA: North of Natalau, between Lautoka and Nandi, *Degener 14995*; vicinity of Tumbenasolo, valley of Namosi Creek, *Smith 4625*. NANDRONGA & NAVOSA: Korotongo, east of Singatoka, *O. & I. Degener 32198*. SERUA: Flat coastal strip in vicinity of Ngaloa, *Smith 9511*. RA: Vatundamu, vicinity of Rewasa, near Vaileka, *Degener 15359*. TAILEVU: Naingani Island, *DA 3311*; near Londoni, *DA 14423*. REWA: Mt. Korombamba, *DA 2613*. KANDAVU: Namalata isthmus region, *Smith 14*. ONO: *DA 14951*. OVALAU: Vicinity of Thawathi, *Smith 8094*. NGAU: Shore of Herald Bay, vicinity of Sawaieke, *Smith 7904*. VANUA LEVU: MATHUATA: Nakuthi Island, near mouth of Ndreketi River, *DA 15285*. THAKAUNDOVE: Nasinu, Natewa Bay, *DA 16846*. TAVEUNI: Waiyevo, *DA 5730*. MOALA: North coast, *Smith 1393*. VANUA MBALAVU: Near Namalata Village, *Garnock-Jones 1116*. LAKEMBA: Near Tumbou Jetty, *Garnock-Jones 789*. FULANGA: On limestone, *Smith 1207*. FIJI without further locality, *U. S. Expl. Exped., Seemann 80*.

2. *EMMENOSPERMA* F. v. Muell. Fragm. Phyt. Austral. 3: 62. 1862; Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20d: 85. 1953; M. Johnston in Brittonia 23: 5, 50, 51. 1971.

A genus closely related to *Colubrina*, differing in having its inflorescences more elaborate thyrses, obviously pedunculate, and comparatively many-flowered, and its fruit with a leathery or thick-crustaceous rather than thin-crustaceous or cartilaginous endocarp. However, the inflorescences are not necessarily terminal (being axillary in our species, FIGURE 169A, and also in *Emmenosperma papuanum* (Merr. & Perry) M. Johnston), nor are the flowers necessarily yellow, as implied by Johnston in 1971.

TYPE SPECIES: *Emmenosperma alphonsoioides* F. v. Muell.

DISTRIBUTION: *Emmenosperma* now includes five species occurring in Australia, New Guinea, New Caledonia, and Fiji, where an endemic species terminates the generic range.

1. *Emmenosperma micropetalum* (A. C. Sm.) M. Johnston in *Brittonia* 23: 50. 1971.

FIGURE 169A-D.

Colubrina papuana sensu A. C. Sm. in *Bull. Torrey Bot. Club* 70: 545. 1943; non Merr. & Perry.*Colubrina micropetala* A. C. Sm. in *J. Arnold Arb.* 31: 302. 1950; J. W. Parham, *Pl. Fiji Isl.* 153. 1964, ed. 2. 218. 1972.

Tree or shrub 3-15 m. high, sometimes copiously branching, sometimes slender or subsucculent, with a trunk up to 45 cm. in diameter, occurring at elevations from near sea level to about 900 m. in dense or secondary forest, thickets, forest patches in open country, or in grassland. Its alternate leaves have slender petioles 10-27 mm. long and oblong- or ovate-elliptic blades up to 18 × 8 cm.; inflorescences with peduncles 2-4 cm. long; calyx lobes white, thick, and fleshy; anthers white and scarcely exceeded by the inconspicuous, amplexant petals; fruits 15-18 mm. in diameter, yellowish brown to dull russet-green; seeds compressed-ellipsoid, to 10 × 8 mm., red to orange. Flowers have been noted between November and April, fruits throughout the year.

TIPIFICATION: The type is *Smith 6736* (A HOLOTYPE; many ISOTYPES), collected Nov. 28, 1947, on the Seangangga Plateau, in drainage of Korovuli River, vicinity of Natua, Mathuata Province, Vanua Levu.

DISTRIBUTION: Endemic to Fiji and known only from the two largest islands, now represented by 26 collections, all here cited since most have not previously been mentioned. Apparently Storck and Horne obtained the earliest material of this interesting endemic.

LOCAL NAMES AND USES: *Tomanu* and *vere* have been recorded, the latter indicating an awareness of its general similarity to *Colubrina asiatica*. It has been noted by foresters as a useful timber tree, and its wood is locally used to make tool handles.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, *Greenwood 856*. SERUA: Nambukelevu, upper Navua River, *DA 15663*; north of Korovou, *St. John 18948*; vicinity of Ngaloa, *DA L.22328 (DF 117)*, *DA L.22422 (DF 123)*. NAMOSI: Hills bordering Wainavindrau Creek, vicinity of Wainimakutu, *Smith 8609*; Lombau River, *DF 516*, *Damanu 150*; Wairoro Creek, *Bola 56*; Nambukavesi Creek, *DA 13743 (Bola 53)*, *DF 512*, *Vaisewa 21*. NAITASIRE: Naiyathini (Naivuthini?), *DA 1535*; Taulevu-Vunindawa road, *DA 741*; Tholo-i-suva, *DA 11848*; vicinity of Nasinu, *Gillespie 3599.9*, *3611*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7039*; Sala Makewa, Line 2, *DA 16201*. VANUA LEVU: MBUA: "Sides of stream," *Horne 1116*. MATHUATA: Vicinity of Natua, *DA 15352*; District Farm Northern, *DA 15376*. THAKAUNDOVE: Nasauva, Undu Point, *DA 13485*; Navonu Creek, Natewa Peninsula, *Howard 203*. FIJI without further locality, *Storck XXII*.

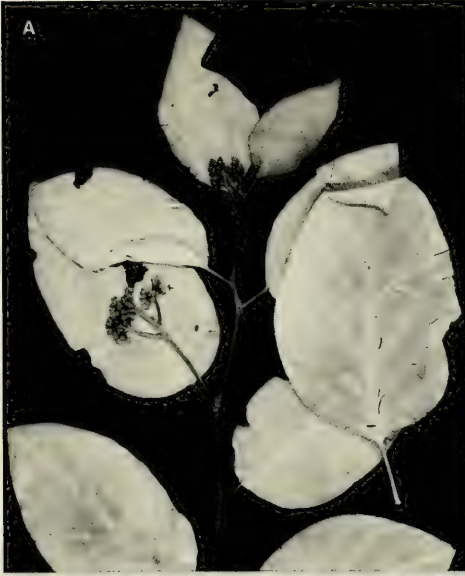
3. ALPHITONIA Reissek ex Endl. *Gen. Pl.* 1098. 1840; A. Gray, *Bot. U. S. Expl. Exped.*

1: 277. 1854; Seem. *Fl. Vit.* 42. 1865; Braid in *Kew Bull.* 1925: 168. 1925; Suesseng. in *Engl. & Prantl, Nat. Pflanzenfam.* ed. 2. 20d: 91. 1953.

Trees or shrubs with alternate leaves, the blades pinnate-nerved and usually conspicuously paler or ferruginous beneath; inflorescences freely branched thyrses, the flowers small, ♀, 5-merous; ovary immersed in disk filling calyx tube, 2- or 3-celled, the style short and 2- or 3-lobed; fruit with a spongy exocarp and a crustaceous endocarp, the endocarps dehiscing along the ventral suture and partially down the dorsal suture.

TYPE SPECIES: *Alphitonia excelsa* (Fenzl) Reissek ex Benth. (*Colubrina excelsa* Fenzl).

FIGURE 169. A-D, *Emmenosperma micropetalum*; A, distal portion of branchlet, with foliage and inflorescences, × 1/2; B, terminal portion of inflorescence branch and maturing flowers, × 10; C, flower, with 2 sepals removed, × 10; D, fruits and seeds, × 1. E, *Colubrina asiatica*; fruits and seeds, × 1. A-D from *Smith 7039* (detached leaf of A from *DA 11848*), E from *Smith 9511*.



DISTRIBUTION: Malesia from the Philippines and Borneo eastward to northern and eastern Australia and into the Pacific to the Society Islands and Hawaii, with 13-20 species. Two species are here considered to occur in Fiji.

USEFUL TREATMENT OF GENUS: BRAID, K. W. Revision of the genus *Alphitonia*. Kew Bull. 1925: 168-186. 1925.

In addition to the two species discussed below, *Alphitonia excelsa* (Fenzl) Reissek ex Benth. and *A. vieillardii* Lenorm. ex Guillaumin have been recorded from Fiji. In his revision of 1925 Braid indicates the former as limited to Australia, while *A. vieillardii* was reported from Fiji on the basis of an im Thurn collection which I refer to *A. franguloides*. *Alphitonia vieillardii*, typified by *Vieillard 2488* (K ISOTYPE), is a very small-leaved species, probably endemic to New Caledonia. Certainly no more than two species occur in Fiji, and even these two are separated with difficulty. Braid, followed by Suessenguth, uses the leaf base as a differentiating character between clusters of species, but Braid is skeptical as to whether *A. franguloides* is any more than a depauperate form of *A. zizyphoides*. In this he may be quite correct, but nevertheless two populations are discernible in Fiji on somewhat imprecise grounds. In general the larger form (referable to *A. zizyphoides*) usually, but not always, occurs in comparatively wet lowland forests, while the smaller form (*A. franguloides*) is habitually found in higher and drier areas. Although a real distinction between these may be questioned, at least at a specific level, they are maintained for the time being on the basis of the following key.

KEY TO SPECIES

Leaf blades ovate-oblong to lanceolate, 6-18 × 3-6.5 cm., usually rounded at base but sometimes acute, acute to short-acuminate at apex and often obviously mucronate, the secondary nerves 11-14 per side, 4-17 mm. apart; calyx 5-6.5 mm. in diameter at anthesis, the sepals 1.8-2.2 mm. long, the petals 1.5-2.2 mm. long. 1. *A. zizyphoides*

Leaf blades elliptic or oblong-elliptic to lanceolate, 3-10 × 1.5-4 cm., usually acute at base but sometimes rounded, rounded to acute at apex or sometimes minutely mucronate, the secondary nerves 7-12 per side, 3-11 mm. apart; calyx 4-5 (-6) mm. in diameter at anthesis, the sepals 1.2-1.7 (-2) mm. long, the petals 1-1.7 mm. long. 2. *A. franguloides*

1. *Alphitonia zizyphoides* (Spreng.) A. Gray, Bot. U. S. Expl. Exped. 1: 278. 1854, Atlas, pl. 22, A. 1856; Seem. in Bonplandia 9: 255, p. p. 1861, Viti, 434, p. p. 1862; A. Gray in Proc. Amer. Acad. Arts 5: 316, p. p. 1862; Braid in Kew Bull. 1925: 183. fig. 4. 1925; Guillaumin in J. Arnold Arb. 12: 239. 1931; Christophersen in Bishop Mus. Bull. 128: 134. 1935; Yuncker in op. cit. 178: 79. 1943, in op. cit. 184: 49. 1943, in op. cit. 220: 178. 1959; J. W. Parham, Pl. Fiji Isl. 153. 1964, ed. 2. 218. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 172. 1970; St. John & A. C. Sm. in Pacific Sci. 25: 332. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 130. 1972. FIGURE 170A & B.

Rhamnus zizyphoides Solander ex Forst. f. Fl. Ins. Austr. Prodr. 90, nom. nud. 1786; Spreng. Mant. Pr. Fl. Halens. 37. 1807, Syst. Veg. 1: 768. 1824; DC. Prodr. 2: 27. 1825.

Alphitonia excelsa sensu Seem. Fl. Vit. 43, p. p. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 140, p. p. 1890; non Reissek ex Benth.

Tree 5-25 m. high, often spreading or with a compact crown and with a trunk to 60 cm. in diameter (sometimes a shrub about 3 m. high), found from near sea level to 300 m. (rarely to 600 m.) and often locally abundant in dense or dry forest, in thickets, and on reed-covered forehills. The fragrant flowers have the calyx pale green, the petals white or cream-white, the anthers white, the disk pale green, and the ovary white to pale green; the fruit turns from green to dark brown or black at maturity. Flowers and fruits are found throughout the year.

TYPIFICATION AND NOMENCLATURE: Sprengel noted as the type a Forster collection from the Society Islands, taking up the epithet from G. Forster's use of it in 1786, which was based on a specimen from the first Cook voyage ascribed to Solander (BM). Seemann's and Drake's mention of *Alphitonia excelsa* is based on *Seemann 81*, a



FIGURE 170. A & B, *Alphitonia zizyphoides*: A, portion of branchlet with foliage and infructescences, $\times 1/3$; B, infructescences, $\times 1$. C & D, *Alphitonia franguloides*: C, distal portion of branchlet, with foliage and inflorescences, $\times 1/3$; D, endocarpid, with part of the adherent, spongy exocarp, and a seed, $\times 6$. A from *Bryan 447*, B from *DA 847*, C from *DA 11232*, D from *Parks 20683*.



FIGURE 171. *Alphontonia franguloides*, from DA 11232; A, ultimate branchlet of inflorescence, $\times 4$; B, flower and buds, $\times 10$.

mixed collection of *A. zizyphoides* and *A. franguloides*, all three names having been combined by Seemann (1865).

DISTRIBUTION: New Hebrides to Society Islands, and possibly also in New Caledonia. In Fiji it is abundant at low elevations, about 80 collections from 15 islands being at hand.

LOCAL NAMES AND USES: *Ndoi* is the Fijian name in general use, but the following are also recorded: *ndoi ndamu*, *ndoi selawa*, *selavo*, *selavua*, and *maio*. Flowers are so abundant in May (although occurring throughout the year) that the month was sometimes known as *vula i ndoi* (Seemann, 1865). Medicinal uses are ascribed to the species, the inner part of the bark sometimes being used as part of an internal remedy for headaches, weakness after childbirth, and "sickness in bones." It is considered a timber tree (noted as of limited value or as "non-commercial" by most foresters) and also produces good firewood.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Olo Creek, north of Yalombi, *St. John 18019*. VITI LEVU: MBA: Slopes of Mt. Nairosa, eastern flank of Mt. Evans Range, *Smith 4002*; Nandala Creek, near Nandarivatu, *Vaughan 3391*. NANDRONGA & NAVOSA: Nausori Highlands, *DF 847 (S1424/2)*. SERUA: Mbuyombuyo, near Namboutini, *Tabualewa 15583*. NAMOSI: Between Wainimakutu and Mt. Naitarandamu, *Gillespie 3082*. RA: Vicinity of Rewasa, near Vaileka, *Degener 15341*. NAITASIRI: Wainamo Creek, near Matawailevu, Wainimala Valley, *St. John 18244*; Viria, *Meebold 17038*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7022*; Naingani Island, *DA 3350*. REWA: Vicinity of Suva, *Tothill 77a*. MBENGGGA: Malambi, *Weiner 214*. KANDAVU: Naikorokoro, *DF 846 (S1424/1)*. OVALAU: *U. S. Expl. Exped.* NGAU: Hills east of Herald Bay, inland from Sawaieke, *Smith 7807*. VANUA LEVU: MBUA: Near Ndama Village, *DA 16689*. MATHUATA: Naravuka, Seangangga River, *DF 997 (S1424/4)*. THAKAUNDOVE: Hills west of Korotasere, *Smith 1921*. TAVEUNI: Vicinity of Waiyevo, *Gillespie 4630*. MOALA: Near Naro, *Smith 1306*. MATUKU: *Bryan 242*. TOTOTA: *Milne 86*. VANUA MBALAVU: Northern limestone section, *Smith 1500*. LAKEMBA: East of Levuka, *Garnock-Jones 974*. KAMBARA: Central basin, *Bryan 501*. FULANGA: *Bryan 447*. FIJI without definite locality, *Seemann 81*, p. p. (Mathuata in Vanua Levu; Viti Levu).

2. *Alphitonia franguloides* A. Gray, Bot. U. S. Expl. Exped. 1:280. 1854, Atlas, pl. 22, B. 1856; Braid in Kew Bull. 1925: 181, fig. 10. 1925; J. W. Parham, Pl. Fiji Isl. 153. 1964, ed. 2. 218. 1972. FIGURES 170C & D, 171.

Alphitonia zizyphoides sensu Seem. in Bonplandia 9:255, p. p. 1861, Viti, 434, p. p. 1862; A. Gray in Proc. Amer. Acad. Arts 5: 316, p. p. 1862; non A. Gray (1854).

Alphitonia excelsa sensu Seem. Fl. Vit. 43, p. p. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 140, p. p. 1890; Gibbs in J. Linn. Soc. Bot. 39: 143. 1909; Turrill in op. cit. 43: 18. 1915; non Reissek ex Benth.

Alphitonia vieillardii (sic) sensu Braid in Kew Bull. 1925: 179, p. p. 1925; J. W. Parham, Pl. Fiji Isl. 153. 1964, ed. 2. 218. 1972; non sensu typi.

Alphitonia franguloides occurs from near sea level to an elevation of 1,195 m. in dry or open forest, thickets, exposed rocky places, and on open slopes, as a shrub or tree 0.5–20 m. high, often with a compact crown or with spreading branches. The flowers are fragrant, with a white to pale yellow calyx, white to greenish white petals and stamens, and a greenish disk and gynoecium; the fruits become black at maturity. Flowers and fruits occur throughout the year.

TYPEFIICATION AND NOMENCLATURE: The type is U. S. Expl. Exped. (US 17196 HOLOTYPE; ISOTYPE at K), collected in 1840 at Mbua Bay ("&c."), Mbua Province, Vanua Levu. Misidentifications are recorded above merely to account for the use of those binomials in Fiji.

DISTRIBUTION: Endemic to Fiji, as here interpreted, about 60 collections from seven of the high islands being available.

LOCAL NAMES AND USE: In addition to the usual (generic) Fijian name *ndoi*, the following have been noted: *ndoi ndamu*, *ndoi ndra*, and *ndoindoi*. The timber is said to be useful but presumably is not cut on a commercial scale.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Nangua, *St. John 18116*. MAMANUTHAS: NGGALITO Island, Malolo Group, *O. & I. Degener 32240*. VITI LEVU: MBUA: Ndrasa Forest Reserve, near Lautoka, *DA 12449 (DF94, Watkins 752)*; eastern slopes of Mt. Koroyanitu, Mt. Evans Range, *Smith 4118*; Nandarivatu and vicinity, *Gibbs 575, im Thurn 57, Parks 20683*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 13340*. NAMOSI: Summit of Mt. Naitarandamu, *Gillespie 3242*; summit of Mt. Voma, *Gillespie 2735*. RA: Vicinity of Rakiraki, *Degener & Ordenez 13698*. NAITASIRI: Northern portion of Rairaimatuku Plateau, between Mt. Tomanivi and Nasonggo, *Smith 6114*; Tholo-i-suva, *DA 11232*. NAITASIRI-REWA boundary: Mt. Kombalevu, *Parks 20313*. REWA: Mt. Korombamba, *Meebold 17025*. VITI LEVU without further locality, *Seemann 81*, p. p. KANDAVU: Without further locality, *Seemann 81*, p. p. OVALAU: Summit of Mt. Ndelaiovalau and adjacent ridge, *Smith 7563*. VANUA LEVU: MBUA: Koromba Forest, Wairiki, *DA 15130*. MATHUATA: Nanduri, *Tothill 457*. THAKAUDROVE: Hills west of Mbutha Bay, Natewa Peninsula, *Smith 828*. TAVEUNI: Mt. Manuka, east of Wairiki, *Smith 783*.

4. *Paliurus* Mill. Gard. Dict. Abridg. ed. 4. 1754; Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20d: 121. 1953.

Small trees or shrubs, usually with spiny stipules, the leaves alternate, the blades 3-nerved from base; flowers ζ , 5-merous, in small cymes; fruit depressed-subglobose, with a broad horizontal wing about 2.5 cm. in diameter spreading from near middle, 2- or 3-locular, each locule with a single seed.

TYPE SPECIES: *Paliurus spina-christi* Mill. (*Rhamnus paliurus* L.).

DISTRIBUTION: Eurasia, with about eight species, one of which is infrequently cultivated in Fiji.

1. *Paliurus spina-christi* Mill. Gard. Dict. ed. 8. 1768; Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20d: 122, fig. 33. 1953; J. W. Parham, Pl. Fiji Isl. ed. 2. 219. 1972.

Rhamnus paliurus L. Sp. Pl. 194. 1753.

Paliurus spina-christi is apparently a recent introduction to cultivation in Fiji, occurring near sea level as a spreading shrub or small tree to 6 m. high, with disparate

spines at each petiole base and with minutely serrulate leaf blades, with yellow or greenish yellow flowers and a brownish yellow fruit. This is the most commonly cultivated species of the genus, widely grown for its curious, flattened, circular fruit and its legendary interest, as it is sometimes considered the tree from which the crown of thorns was made.

TYPIFICATION: Linnaeus originally cited several references, the plant having been well known in southern Europe.

DISTRIBUTION: Southern Europe to the Himalayas and northern China. In Fiji only one collection has been noted.

LOCAL NAMES AND USE: The usual names, not locally recorded, are *Jerusalem thorn* or *Christ's thorn*, and the plant is an ornamental curiosity.

AVAILABLE COLLECTION: VITI LEVU: TAILEVU: Nausori, *DA L.15614* (coll. *W. Thompson*).

5. *ZIZIPHUS* Mill. Gard. Dict. Abridg. ed. 4. 1754; Brizicky in J. Arnold Arb. **45**: 459. 1964.

Zizyphus Adanson, Fam. Pl. **2**: 304, orth. var. 1763; Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **20d**: 123. 1953.

Trees or shrubs, usually with spiny stipules, the leaves alternate, the blades 3- or 5-nerved from base; flowers ♂, 5-merous, in axillary cymes; ovary sunk in disk, usually 2-locular; fruit a globose or ellipsoid drupe, unwinged, the mesocarp fleshy, the endocarp bony, the seed often solitary.

LECTOTYPE SPECIES: *Zizyphus jujuba* Mill. (*Rhamnus zizyphus* L.) (vide Suessenguth in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **20d**: 124. 1953). Although *Zizyphus* is the correct spelling, the generic name is often spelled *Zizyphus*; the variant spellings are not noted in the following citations.

DISTRIBUTION: Pantropical and subtropical, perhaps with as many as 100 species, of which two are cultivated or naturalized in Fiji.

KEY TO SPECIES

Evergreen tree or shrub, the branchlets and lower surfaces of leaf blades copiously pale-tomentose.

1. *Z. mauritiana*

Deciduous tree or shrub, the branchlets and leaves glabrous, the leaf blades green on both surfaces.

2. *Z. jujuba*

1. *Zizyphus mauritiana* Lam. Encycl. Méth. Bot. **3**: 319. 1789; Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **20d**: 124. fig. 35. *A-D*. 1953; Purseglove, Trop. Crops, Dicot. **642**. 1968; J. W. Parham, Pl. Fiji Isl. ed. 2. 219. 1972.

Rhamnus jujuba L. Sp. Pl. 194. 1753.

Zizyphus jujuba Lam. Encycl. Méth. Bot. **3**: 318. 1789; Greenwood in Proc. Linn. Soc. **154**: 95. 1943; J. W. Parham in Dept. Agr. Fiji Bull. **35**: 96. 1959, Pl. Fiji Isl. **154**. 1964; non Mill.

As seen in Fiji, *Zizyphus mauritiana* is a thorny tree 4–10 m. high, introduced and cultivated, sometimes naturalized along roadsides and in agricultural land, usually near sea level but occasionally up to an elevation of about 600 m. The flowers are white or greenish white, and the fruits are orange to brown, 2–3 cm. long, with edible white pulp surrounding a 2-locular pyrene. Flowers have been obtained between January and May, fruits only in June.

TYPIFICATION AND NOMENCLATURE: The type of *Zizyphus mauritiana* is a *Sonnerat* specimen (P HOLOTYPE in Herb. Lamarck) from Mauritius. The simultaneously published *Z. jujuba* Lam. (not to be confused with *Z. jujuba* Mill.) is also based on a *Sonnerat* collection (P HOLOTYPE in Herb. Lamarck) from the "East Indies." Since the latter name is a homonym of Miller's, the present species must be called *Z. mauritiana*.

DISTRIBUTION: Perhaps originally a native of India, *Ziziphus mauritiana* is apparently now widely naturalized from tropical Africa to Afghanistan and China, and also through Malesia and into Australia and some Pacific archipelagoes; its range as an ornamental is even more extensive. In Fiji it is recorded only from the two largest islands, where it is now relatively common as a weed of waste places; probably it was introduced in the late 1890's or early 1900's (Parham, 1959).

LOCAL NAMES AND USES: The usual name for this species is *Indian jujube*, but in Fiji the Hindi names *bahir* and *baher* are also used. The fruit is edible fresh or dried, and is made into chutney; it is also used as a dessert, sometimes candied, and is the basis of a refreshing drink.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Ndreketi, Lautoka, DA 11758; Namaka, Nandi, DA 11598. NANDRONGA & NAVOSA: Nausori Highlands, DF 1217 (Johns 13). RA: Rariraki, DA 11817 (L.5223). NAITASIRI: Sawani, DA 976. REWA: Suva Botanical Gardens, DA 1316, 12333. VANUA LEVU: MATHUATA: Lambasa, Greenwood 471.

2. *Ziziphus jujuba* Mill. Gard. Dict. ed. 8. 1768; B. E. V. Parham in Agr. J. Dept. Agr. Fiji **10**: 116. 1939; J. W. Parham in op. cit. **19**: 101. 1948; Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **20d**: 126, fig. 11, 34 (left), 35, G, H. 1953; J. W. Parham in Agr. J. Dept. Agr. Fiji **29**: 33. 1959, Pl. Fiji Isl. ed. 2. 219. 1972.

Rhamnus zizyphus L. Sp. Pl. 194. 1753; non *Rhamnus jujuba* L.

The *Chinese jujube* is less common in Fiji than the preceding species, being known only in cultivation near sea level, as a tree 5-10 m. high with sharp, slender spines; when mature the fruit is dark red to brown or nearly black and is 2.5-5 cm. long.

TYPEIFICATION: By referring to this species as the "common Jujube," Miller doubtless intended it as the Linnaean *Rhamnus zizyphus*, which in turn is based on several prior references, including L. Fl. Zeyl. 89. 1747.

DISTRIBUTION: Southeastern Europe to southern and eastern Asia; widely cultivated elsewhere. B. E. V. Parham (1939) noted that it was introduced into Fiji in 1924 and was growing on the property of W. L. Wallace, Tovu Island, Ra Province, Viti Levu. The specimen cited below may have been from a later introduction.

LOCAL NAMES AND USES: In addition to the commonly used name *Chinese jujube*, this species is locally known as *jujube*, *jujube tree*, *Chinese date*, and *ber*. The fruits are eaten fresh, dried, candied, and preserved.

AVAILABLE COLLECTION: VITI LEVU: REWA: Suva Botanical Gardens, DA 5561.

6. RHAMNELLA Miq. Ann. Mus. Bot. Lugd.-Bat. **3**: 30. 1867 (repr. Prol. Fl. Jap. 218. 1867); A. C. Sm. in Bull. Torrey Bot. Club **70**: 544. 1943; Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **20d**: 146. 1953; A. C. Sm. in J. Arnold Arb. **36**: 282. 1955.

Dallachya F. v. Muell. Fragm. Phyt. Austral. **9**: 140. 1875; Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **20d**: 149. 1953

Unarmed trees or shrubs or sometimes lianas, the leaf blades chartaceous, pinnately-veined, the stipules small, deciduous; inflorescences compact, few-flowered cymes or reduced thyrses, or the flowers essentially fasciculate; flowers ♂, 5-merous, the calyx tube cupuliform, the lobes small, deltoid; petals involute, small, at anthesis exceeded in length by the small anthers; disk broadly cupuliform, concave, the ovary at base slightly sunk in disk, incompletely 2-locular, the style short, with 2 inconspicuous stigmatic lobes; fruit an ellipsoid or narrowly obovoid drupe, free from disk, 1(or perhaps sometimes 2)-seeded, the endocarp cartilaginous, indehiscent.

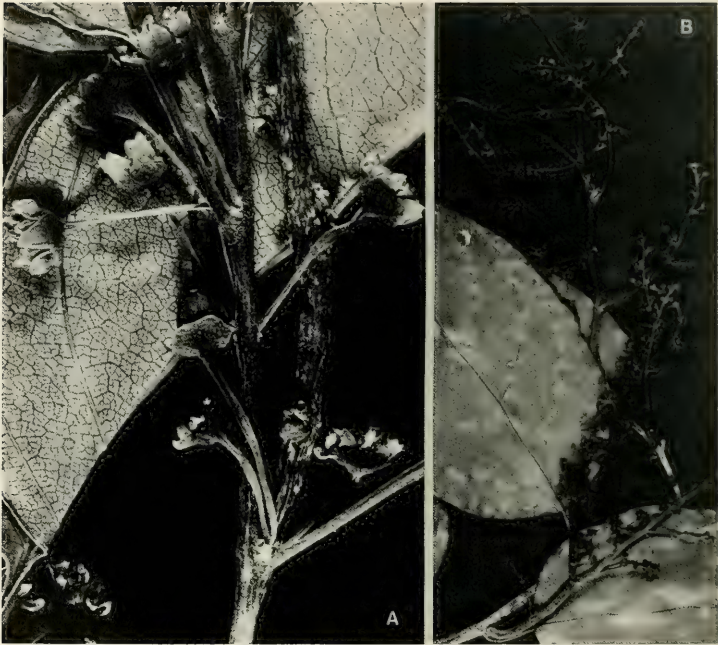


FIGURE 172. A, *Rhamnella vitiensis*; inflorescences and lower surface of leaf blade, $\times 4$. B, *Ventilago vitiensis*; portions of inflorescences and foliage, $\times 1$. A from *Smith 1113*, B from *Bryan 490*.

TYPE SPECIES: *Rhamnella iaponica* Miq. = *R. franguloides* (Maxim.) Weberbauer. The type species of *Dallachya* is *D. vitiensis* (Benth.) F. v. Muell. (*Rhamnus vitiensis* Benth.) = *Rhamnella vitiensis* (Benth.) A. C. Sm. Suessenguth (1953) did not accept my (1943) reduction of the monotypic *Dallachya* to *Rhamnella*, or more probably he was unaware of the suggestion.

DISTRIBUTION: Continental Asia and Japan to New Guinea, eastern Australia, Fiji, and Tonga, with nine or ten species, one of which reaches the Fijian Region.

1. *Rhamnella vitiensis* (Benth.) A. C. Sm. in *Bull. Torrey Bot. Club* **70**: 544. 1943, in *J. Arnold Arb.* **36**: 282. 1955; Yuncker in *Bishop Mus. Bull.* **220**: 177. 1959; J. W. Parham, *Pl. Fiji Isl.* 154. 1964, ed. 2. 219. 1972; M. Johnston in *Brittonia* **23**: 51. 1971.

FIGURES 172A, 173A.

Rhamnea Seem. in *Bonplandia* **9**: 255. 1861; A. Gray in *Proc. Amer. Acad. Arts* **5**: 316. 1862.

Colubrina vitiensis Seem. *Viti*, 434, nom. nud. 1862.

Rhamnus vitiensis Benth. *Fl. Austral.* **1**: 413. 1863; Seem. *Fl. Vit.* **42**. 1865; Drake, *Ill. Fl. Ins. Mar. Pac.* **139**. 1890; Burkill in *J. Linn. Soc. Bot.* **35**: 32. 1901.

Dallachya vitiensis F. v. Muell. *Fragm. Phyt. Austral.* **9**: 140. 1875; Suesseng. in *Engl. & Prantl, Nat. Pflanzenfam.* ed. 2. **20d**: 149. 1953.

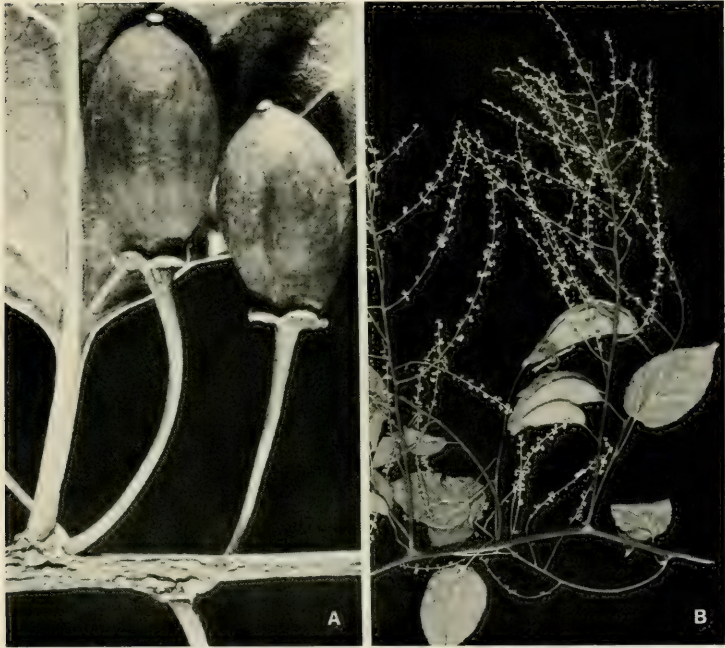


FIGURE 173. A, *Rhamnella vitiensis*: fruits, $\times 6$. B, *Gouania richii*: portion of branchlet with foliage and inflorescences, a tendril terminating a short lateral branchlet in the center, $\times 1$. 3. A from *Smith 6488*, B from *Gillespie 3664*.

A sometimes gnarled tree or scandent shrub 3–5 m. high, or a liana, occasional at elevations from near sea level to about 550 m. in dry forest and on its edges, in patches of forest in open country, on rocky shores and cliffs, and on exposed ridges. Its sepals and petals are pale yellow, its stamens, disk, and gynoecium are yellowish, and its fruit becomes deep purple at maturity. Both flowers and fruits have been obtained in months between October and February.

TIPIFICATION: The type is *MacGillivray* (κ HOLOTYPE, 2 sheets), collected Nov. 12 and 14, 1849, at Cape York, Queensland, Australia. As I noted in 1943, the original description of *Rhamnus vitiensis* is based entirely on the MacGillivray material, Seemann's *Colubrina vitiensis* (nom. nud.) being mentioned in passing by Bentham with the remark: "Apparently the same species was gathered in the Fiji Islands by Seemann, and his specimens have young fruits, of an obovoid-oblong shape, which, as far as they go, agree with those of *Rhamnus*." Other synonyms not involving Fijian plants are listed in my 1943 discussion.

DISTRIBUTION: New Guinea, Queensland, and New Caledonia and the Loyalty Islands through the New Hebrides and Fiji to Tonga. It seems scattered and not common in Fiji, all the specimens known to me being here cited.

LOCAL NAME: *Taka*, recorded only from Fulanga.

AVAILABLE COLLECTIONS: VITI LEVU: Mba: North of Lomolomo, *Degener & Ordenez 13713*; vicinity of Lautoka, *Greenwood 398*; mountains near Lautoka, *Greenwood 1095*; Thelau, west of Mba, *O. & I. Degener 32147, 32150A*. KANDAVU: Hills above Namalata and Ngaloa Bays, *Smith 123*. OVALAU: Vicinity of Levuka, *Gillespie 4482*. NAIRAI: *Milne 176*. VANUA LEVU: MATHUATA: *Seemann 85*; Seangangga Plateau, in drainage of Korovuli River, vicinity of Natua, *Smith 6712*; vicinity of Lambasa, *Greenwood 398A*; southern slopes of Mt. Numbuloa, east of Lambasa, *Smith 6488*; Mathuata coast, *Greenwood 398B*. THIKOMBIA-I-LAU: *Tohill 580*. FULANGA: On limestone formation, *Smith 1113*.

The single species of *Rhamnella* known from the Australian-Pacific area seems most closely related to *R. rubrinervis* (Léveillé) Rehder, differing in its glabrous habit, serrulate or crenulate leaf blade margins, and its simpler inflorescences.

7. *VENTILAGO* Gaertn. Fruct. Sem. Pl. 1: 223. 1788; Seem. Fl. Vit. 41. 1865; Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20d: 151. 1953; A. C. Sm. in J. Arnold Arb. 36: 282. 1955.

Scandent shrubs or lianas, the leaves distichous, the blades penninerved and with closely parallel transverse tertiary venation; inflorescences cymose, the cymes or fascicles borne in irregular, axillary or terminal panicles; flowers ♂, 5-merous, the calyx tube cupuliform, with small deltoid lobes; petals clawed, obovate, small; disk filling calyx tube, the ovary immersed in it and partially inferior at maturity, 2-locular, the style very short, with 2 inconspicuous stigmas; fruit an indehiscent drupe with an apical wing much longer than the seminiferous part, the seeds 1 or 2.

TYPE SPECIES: *Ventilago madraspatana* Gaertn.

DISTRIBUTION: Indo-Malesia, tropical Africa, and Madagascar, and in the Pacific eastward to the Palau Islands, Australia, Tonga, and the Cook Islands, with about 40 species. *Ventilago vitiensis*, mentioned as endemic to Fiji by me in 1955, is now known from Tonga and the Cook Islands, and therefore my indication of termination of the generic range in Fiji is to be amended.

1. *Ventilago vitiensis* A. Gray, Bot. U. S. Expl. Exped. 1: 274. 1854; Seem. Viti, 434. 1862, Fl. Vit. 41. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 139. 1890; Gillespie in Bishop Mus. Bull. 83: 18. fig. 21. 1931; Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20d: 154. 1953; A. C. Sm. in J. Arnold Arb. 36: 282. 1955; J. W. Parham, Pl. Fiji Isl. 154. 1964, ed. 2. 219. 1972. FIGURES 172B, 174A & B.

An often high-climbing liana found from near sea level to an elevation of about 850 m. in forest and in thickets on open slopes or along beaches. The fragrant flowers have yellow-green or cream-white calyx lobes, and the fruits become brownish at maturity, with a conspicuously veined terminal wing. Flowers and fruits have been noted between May and September.

TIPIFICATION: The species is based on *U. S. Expl. Exped.* (US 16505 HOLOTYPE), collected in 1840 "on the top of a mountain" in Mathuata Province, Vanua Levu.

DISTRIBUTION: Fiji, Tonga, and the Cook Islands. In the two latter archipelagoes the following specimens have now been examined: *Sykes 387/T* (CHR 317326A), from 'Eua, Tonga, and *Sykes 696/CI* (CHR 287304), from Mangaia, Cook Islands. The species is of scattered occurrence in Fiji.

LOCAL NAMES: Recorded names are *vere* and *nggiringgirinawa* (general), *wawa* (Yasawas), and *wa mosi* and *wa nitu* (Mba).

AVAILABLE COLLECTIONS: YASAWAS: WAYA: Nangua, *St. John 18105*. VITI LEVU: Mba: Loloti, in mountains near Lautoka, *Greenwood 264Z*; Vatia Point, *DA 13572*; hills between Nandala and Nukunuku

Creeks, along trail from Nandarivatu toward Lewa, *Smith 6154*; valley of Nggaliwana Creek, north of the sawmill at Navai, *Smith 5369*. SERUA: Namboutini, *DA 13994*. NAMOSI: Mt. Voma, *Gillespie 2894*. NAITASIRI: Tamavua-Sawani road, *Setchell & Parks 15058*; 9 miles from Suva, *Meebold 16867*. VANUA LEVU: MBUA: *Williams* (recorded by Seemann, 1865, but specimen not located at K or BM). MATHUATA: Mountains along coast, *Greenwood 264B*. MOALA: *Tothill 73*. TOTOYA: *Milne 88*. ONEATA: Central forest, *Bryan 490*.

Ventilago vitiensis and *Smythea lanceata*, while immediately distinguished by their very different fruits (FIGURES 174A, 175B) and inflorescences (FIGURES 172B and 175A), are not readily recognized in sterile condition. Nevertheless, dependable if not obvious characters may be utilized to separate them, as indicated in the following supplementary key. Both may also be confused with *Rhamnella vitiensis* in the absence of fruits, but the latter (FIGURE 172A) lacks the striking parallel tertiary venation of *Ventilago* and *Smythea* leaf blades (FIGURES 174B & C), and its branchlets are strongly lenticellate, the other genera having smooth branchlets.

- Indument of young parts (branchlets, petioles, lower leaf blade surfaces, pedicels, and flowers) prevailing appressed, the minute hairs (eventually caducous) golden or brownish or less often cinereous; leaf blades aequilaterally obtuse or rounded at base, and with the transverse tertiary nerves plane to subprominulous on both surfaces; flowers borne in fascicles on lax, irregular, axillary or terminal panicles 4–18 cm. long at anthesis (these occasionally bearing a few small leaves in basal portions); fruit indehiscent, the seed small, 3–4 mm. in diameter, enclosed in a spherical basal portion terminated by a conspicuous, narrow, oblong wing 3–4.5 cm. long. *Ventilago vitiensis*
- Indument of young parts (branchlets, petioles, pedicels, and flowers) spreading, the minute hairs (eventually caducous) white; leaf blades inaequilaterally obtuse or rounded at base (distal base of blade slightly shorter than proximal base), and with the transverse tertiary nerves strongly prominulous on both surfaces; flowers borne in axillary fascicles or contracted racemes (rachis to 3 mm. long) (floriferous branchlets sometimes simulating panicles if leaves are caducous, but then with obvious leaf scars subtending the short inflorescences); fruit dehiscent longitudinally along midline, 2-valved, the seed comparatively large, 10–17 mm. in diameter, enclosed in a compressed basal portion terminated by an indistinctly winglike deltoid portion 1–3 cm. long. *Smythea lanceata*

8. SMYTHEA Seem. in *Bonplandia* 9: 255, nom. nud. 1861; Seem. ex A. Gray in op. cit. 10: 35. (Feb. 15) 1862; Seem. in op. cit. 10: 69. (March 15) 1862, Fl. Vit. 41. 1865; Suesseng. in Engl. & Prantl, *Nat. Pflanzenfam.* ed. 2. 20d: 154. 1953; A. C. Sm. in *J. Arnold Arb.* 36: 282. 1955.

Scandent shrubs or lianas, the leaves distichous, the blades penninerved and with closely parallel transverse tertiary venation; inflorescences fasciculate, axillary or the fascicles borne in short racemes or simulated panicles; flowers ♂, 5-merous, the calyx tube shallow, with small, deltoid lobes; petals clawed, the blade suborbicular; disk filling calyx tube, the ovary 1- or 2-locular, with a bifid style; fruit a 2-valved, narrowly flattened-ovoid capsule with an acute, empty apex slightly exceeding the seminiferous part in length, the seed 1, flattened-obovoid, large.

TYPE SPECIES: *Smythea pacifica* Seem. ex A. Gray = *S. lanceata* (Tul.) Summerhayes. Gray's publication of Feb. 15, 1862, adequately serves as a descriptio generico-specifica. In his more ample discussion of March 15, 1862, Seemann states: "Die Gattung *Smythea*, welche ich zu Ehren meines Reisegefährten auf den Viti-Inseln, des Kgl. Artillerie-Oberst [W. J.] Smythe, eines um die Wissenschaft hochverdienten Mannes,..."

DISTRIBUTION: Seychelles Islands and also from southeastern Asia eastward to the Caroline Islands and Fiji, with about seven species. The generic range terminates in Fiji.

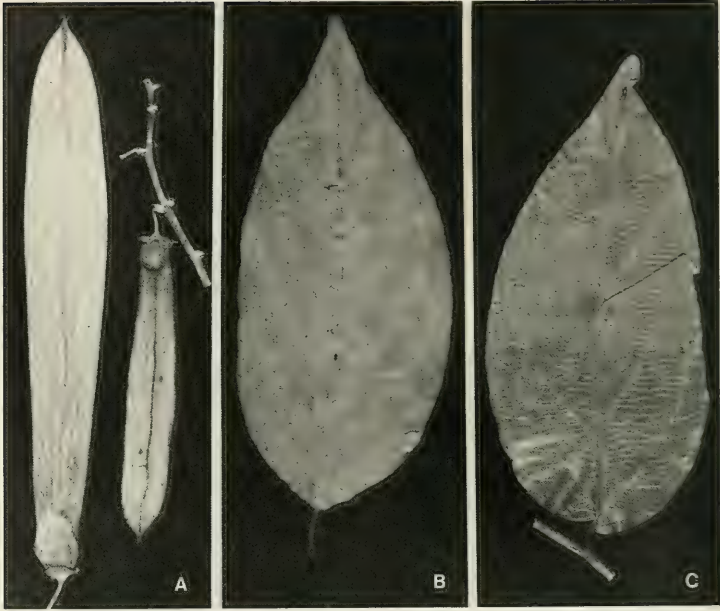


FIGURE 174. A & B, *Ventilago vitiensis*; A, fruits, $\times 2$; B, leaf, upper surface, $\times 1$. C, *Smythea lanceata*: leaf, upper surface, $\times 1$. A from Gillespie 2894, B from Smith 5369, C from MacDaniels 1076.

1. *Smythea lanceata* (Tul.) Summerhayes in Kew Bull. 1928: 389. 1928: Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20d: 155. fig. 41 (right), 42, C, D. 1953; A. C. Sm. in J. Arnold Arb. 36: 282. 1955; J. W. Parham, Pl. Fiji Isl. 154. fig. 58. 1964, ed. 2. 219. 1972. FIGURES 174C, 175.

Ventilago lanceata Tul. in Ann. Sci. Nat. Bot. IV. 8: 121. 1857.

Smythea pacifica Seem. in Bonplandia 9: 255, nom. nud. 1861; Seem. ex A. Gray in Proc. Amer. Acad.

Arts 5: 316, nom. nud. (Jan.) 1862, in Bonplandia 10: 35. (Feb. 15) 1862; Seem. in op. cit. 10: 69. t. 9.

(March 15) 1862, Viti, 59, 434. 1862, Fl. Vit. 41. t. 11. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 139. 1890.

Smythea dupontii Hemsl. in J. Bot. 54: Suppl. 2: 9. 1916.

Liana or sprawling, scandent shrub, found near sea level along beaches, at edge of tidal marshes, along streams behind mangrove swamps, and in thickets on river banks. The sepals, petals, and filaments are green, the anthers yellow, and the fruits turn from green to yellowish. Flowers have been obtained between November and March, fruits between February and June.

TIPIFICATION AND NOMENCLATURE: The type of *Ventilago lanceata* is Pervillé 126 (P HOLOTYPE), from Mahé, Seychelle Islands. *Smythea dupontii* is also from the Seychelles, the type being P. R. Dupont 17 (K HOLOTYPE), from Grand' Anse, Praslin Island. *Smythea pacifica* is typified by Seemann 79 (GH HOLOTYPE), since Gray's 1862 publication was a report on the set of plants sent to him by Seemann; ISOTYPES at BM,

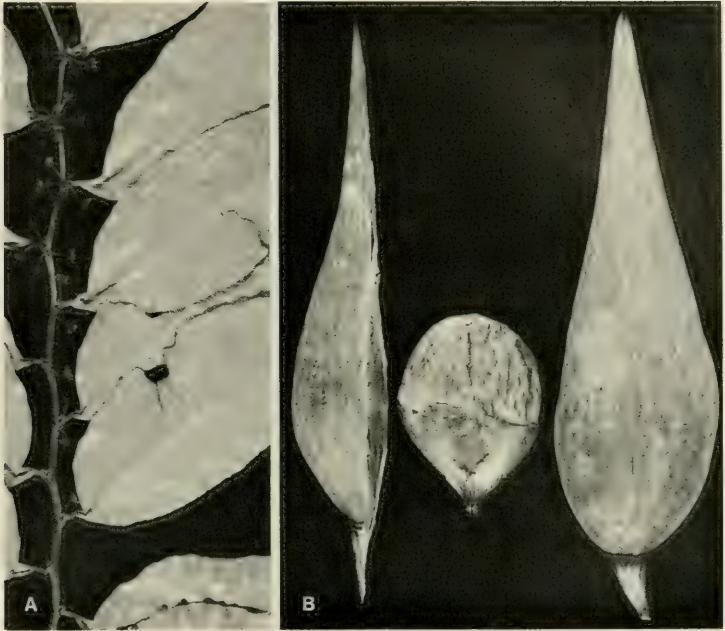


FIGURE 175. *Smythea lanceata*: A, branchlet with inflorescences and foliage, $\times 1$; B, fruit (right), fruit valve (left), and seed (center), $\times 2$. A from Gillespie 4589, B from DA 16822.

κ), collected June 21, 1860, from the southern coast of the Natewa Peninsula, Thakauandrove Province, Vanua Levu. Seemann's note in *Viti* (pp. 58-59) permits placing the type locality of the Fijian element. On June 20 Seemann on the *Paul Jones* went from Taveuni to "a small bay on the southern coast of Vanua Levu, and went on shore the next morning to botanize. The town, built near a great swamp, consists of about forty houses." "Our excursion...also resulted in the discovery of an entirely new genus of *Rhamnaceae*, which I have called, in honour of Colonel Smythe, R. A., *Smythea pacifica*." The precise locality may have been somewhat west of Fawn Harbour, which Seemann knew from another visit and which appears on his *Viti* frontispiece map; very likely he was near the village of Ndromoninuku. From a personal collection (DA 16822) I know that the species is frequent in this locality.

DISTRIBUTION: Seychelles Islands, and also from the Philippines, Malay Peninsula, and Sumatra eastward to the Caroline Islands and Fiji. It is uncommon in Fijian collections, all the material known to me being here cited; however, its local range is probably more extended than the two largest islands and the Yasawas. The similarity of the distribution, in terminal localities, to that of the genus *Stillingia* (Euphorbiaceae; cf. this *Flora*, vol. 2, p. 565) as represented by *S. pacifica* and *S. lineata*, is

noteworthy. In that case I believe that the extremes show morphological dissimilarities; occurrence of the genus is less frequent and discontinuities are greater. One may conclude that *Stillingia* has less vagility and that the isolation of its parts is older, with less introgression. In *Smythea lanceata* the morphological variation is slight and the distribution shows no significant discontinuities except between Malesia and the Seychelles.

LOCAL NAMES: *Vuso* and *ndeni mana* have been recorded.

AVAILABLE COLLECTIONS: YASAWAS: WAYA: Yalombi, DA 13670. VITI LEVU: NANDRONGA & NAVOSA: Thuvu, west of Singatoka, Greenwood 264. SERUA: Navua, Parks 20413. REWA: Vicinity of Lami, Tothill F479, Gillespie 4589, MacDaniels 1076; Waivou, DA 7444; Suva Point Beach, Tothill 74. VITI LEVU without further locality, Milne 289 (Seemann, 1865, mentions a Milne collection from Ovalau, but the only available Milne specimen is clearly indicated as from Viti Levu). VANUA LEVU: MATHUATA: Islands off coast, Greenwood 264C; vicinity of Lambasa, Greenwood 264A; banks of lower Lambasa River, Smith 6628. THAKAUNDRÖVE: Vicinity of Savusavu, Bierhorst F13; Ndromoninuku, DA 16822. FIJI without further locality, Horne 502.

9. *GOUANIA* Jacq. Select. Stirp. Amer. 263. 1763; Seem. Fl. Vit. 43. 1865; Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20d: 166. 1953; Brizicky in J. Arnold Arb. 45: 462. 1964.

Shrubs or lianas, the branchlets often with tendrils, the leaves distichous, the blades pinnerved but with 3 or 5 obvious nerves spreading from base; inflorescences spicate or paniculate, the flowers ♀ and ♂, in short-stalked cymes or fascicles or apparently solitary on inflorescence branches, 5-merous; calyx tube cupuliform, the lobes small, deltoid; petals short-clawed, embracing and often concealing stamens; disk flattened, with an oblong lobe opposite each calyx segment, the ovary inferior, 3 (rarely 4)-locular, the style usually 3-parted; fruit a longitudinally 3 (rarely 4)-winged schizocarp, splitting septically through each wing into 2-winged mericarps, each with a single, basal, obovoid seed.

LECTOTYPE SPECIES: *Gouania tomentosa* Jacq. = *G. polygama* (Jacq.) Urb. (vide Britton & Millspaugh, Bahama Fl. 258. 1920). This was apparently the earliest selection of a lectotype species (cf. Brizicky, 1964, p. 463), although ING (1979) indicates *G. glabra* Jacq., citing Suessenguth (1953).

DISTRIBUTION: Pantropical, with Pacific species eastward to the Tuamotus and Hawaii; the genus probably includes more than 70 species, one of which is believed endemic to Fiji. However, a modern revision is much needed.

1. *Gouania richii* A. Gray, Bot. U. S. Expl. Exped. 1: 282. 1854, in Proc. Amer. Acad. Arts 5: 316. 1862; Seem. Viti, 434. 1862, Fl. Vit. 43. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 141. 1890; Gillespie in Bishop Mus. Bull. 83: 17. fig. 20. 1931; Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20d: 168. 1953; J. W. Parham, Pl. Fiji Isl. 154. 1964, ed. 2. 219. 1972. FIGURES 173B, 176.

Gouania denticulata sensu A. Gray, Bot. U. S. Expl. Exped. 1: 282. 1854; Seem. Viti, 434. 1862, Fl. Vit. 43. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 141. 1890; J. W. Parham, Pl. Fiji Isl. 153. 1964, ed. 2. 219. 1972; non Sm.

Gouania ritchei A. Gray ex Seem. in Bonplandia 9: 255. 1861; A. Gray in op. cit. 10: 35. 1862.

Scandent shrub or liana, often locally abundant at elevations from near sea level to 1,050 m. in open or secondary forest or on its edges or in thickets. The calyx lobes, petals, and filaments are white to greenish white, the anthers pale yellow, the disk is greenish white to pale yellow, and the fruits turn from green to pale brown. Flowers and fruits occur throughout the year.

TIPIFICATION: The type is U. S. Expl. Exped. (US 17267 HOLOTYPE), obtained in 1840 on Vanua Levu but without further information.

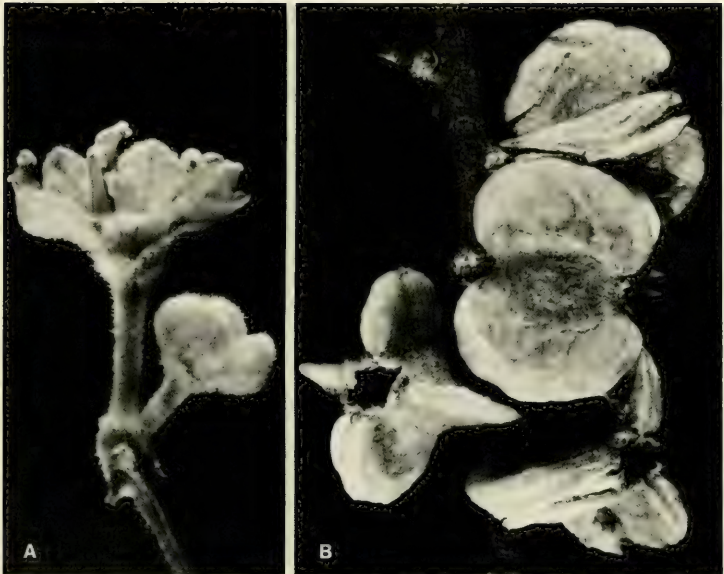


FIGURE 176. *Gouania richii*; A, flower, with 1 sepal and 1 petal removed, $\times 10$; B, fruits, $\times 6$. A from DA 16806. B from DA 13995.

DISTRIBUTION: Endemic to Fiji but thus far known with certainty from only three of the high islands, represented by about 40 collections. The species is often abundant where found and may be expected from other islands.

LOCAL NAMES AND USES: Recorded names are *vere loa*, *wa kau*, *wa kikokiko*, *wa kurakuri*, *wa ndongo*, and *wa nduanaremba*. The stems are used for binding timbers in house-building, and in Ra the leaves are reported to have medicinal properties.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Slopes of Mt. Nairoso, eastern flank of Mt. Evans Range, *Smith 4004*; western slopes of Mt. Mangondro, *Webster & Hildreth 14302*; Mt. Tomanivi, *DA 12770* (*Melville et al. 7162*). NANDRONGA & NAVOSA: Nausori Highlands, *DA 12677* (*Melville et al. 7054*); Uluvatu, vicinity of Mbelo, near Vatukarasa, *Degener 15250*. SERUA: Namboutini, *DA 13995*; inland from Ngaloa, *DA 16806*. NAMOSI: Nakavu, Navua River, *Parks 20375*. RA: Mataimeravula, vicinity of Rewasa, near Vaileka, *Degener 15338*. NAITASIRI: Viria, *Meebold 16718*; vicinity of Nasinu, *Gillespie 3664*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7019*. OVALAU: *U. S. Expl. Exped.*; hills east of Lovoni Valley, *Smith 7342*. VANUA LEVU: MBUA: Upper Ndama River Valley, *Smith 1607*. THAKAUNDROVE: Navonu Creek, Natewa Peninsula, *DA 15224*. FIJI without further locality, *Seemann 82*, *Horne 684*.

FAMILY 153. VITACEAE

VITACEAE Juss. Gen. Pl. 267, as *Vites*. 1789.

Woody vines, usually with leaf-opposed tendrils, rarely small trees or erect herbs, often dioecious or polygamomonocious, the branches often swollen or articulated at nodes, the stipules if present petiolar and usually caducous; leaves alternate (infre-

quently opposite), simple or palmately or pinnately compound, the blades often pellucid-punctate or bearing multicellular, stalked glands; inflorescences leaf-opposed or terminal, infrequently axillary, compound-cymose or racemiform or paniculiform, the peduncles sometimes cirriferous; flowers ♂ or unisexual, small, actinomorphic, hypogynous, haplostemonous, (3 or) 4- or 5(-7)-merous; calyx small, often indistinctly lobed or dentate or much reduced and truncate; petals valvate, free or basally connate, sometimes coherent distally and calyprate; stamens free, opposite petals, the filaments slender, the anthers introrse, dorsifixed, 2-locular, dehiscent by longitudinal slits; disk intrastaminal, annular, cupuliform, or composed of free glands; ovary 2(-6)-locular, often incompletely so, sometimes adnate to disk, the placentation axile, the ovules (1 or) 2 per locule, collateral, ascending from near base, anatropous, apotropous, the style long or short, erect, the stigma inconspicuous or capitate or 4-lobed; fruit a 1- or 2-locular, usually fleshy berry, usually with 2 seeds per locule, the testa usually hard, bony or crustaceous, the embryo small, straight, the endosperm copious, often ruminant.

DISTRIBUTION: Pantropical and subtropical, sometimes extending into temperate areas, with about eleven genera and 700 species. The family is economically important for grapes (*Vitis* spp.) and includes some ornamentals. Two genera have indigenous species in Fiji, and *Vitis* is occasionally cultivated.

USEFUL TREATMENTS OF FAMILY: SUESSENGUTH, K. Vitaceae. Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20d: 174-371. 1953. BACKER, C. A., & R. C. BAKHUIZEN VAN DEN BRINK, JR. Vitaceae. Fl. Java 2: 86-94. 1965.

KEY TO GENERA

- Leaves (in our taxa) 3-foliolate or pedately 4- or 5-foliolate; inflorescences not cirriferous; petals 4, free; indigenous taxa.
- Flowers unisexual, the ♂ with or without a reduced ovary lacking a stigma, the ♀ with minute staminodes and a broadened, usually lobed stigma; leaves in our species 3-foliolate; fruits in our species drying ellipsoid. 1. *Tetrastigma*
- Flowers ♀, the stigma not broadened nor lobed; leaves in our species 3-foliolate or pedately 4- or 5-lobed; fruits in our species drying obovoid. 2. *Cayratia*
- Leaves simple (often lobed); inflorescences sometimes cirriferous; petals 5, coherent distally and calyprate as flower expands; seeds rostrate at base; cultivated only. 3. *Vitis*

1. **TETRASTIGMA** Planch. in DC. Monogr. Phan. 5: 320, 423. 1887; Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20d: 318. 1953; A. C. Sm. in J. Arnold Arb: 36: 282. 1955.

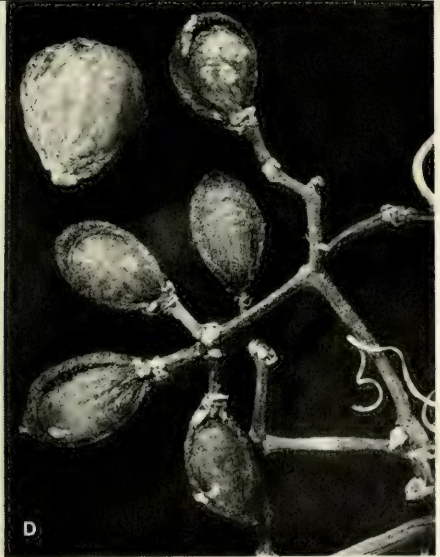
Vitis sect. *Tetrastigma* Miq. Ann. Mus. Bot. Lugd.-Bat. 1: 72. 1863.

Tendrillous, functionally dioecious, climbing shrubs, the tendrils entire or bifid, without adhesive disks; leaves palmately 1-3-foliolate or pedately 4-6-foliolate; inflorescences leaf-opposed (sometimes axillary), the flowers unisexual, 4-merous; calyx truncate to lobed or dentate; petals free, broad-based; disk obvious or obscure (as in our species); stamens in ♂ flowers inserted under disk margin, in ♀ flowers reduced to staminodes with minute, sterile anthers; ovary 2-locular (rudimentary or lacking in ♂ flowers), the ovules 2 per locule, the style short, the stigma broad, usually 4-lobed; fruit a globose or ellipsoid berry, the seeds 1-4, with a ventral, filiform raphe and a dorsal, linear or orbicular chalazal.

LECTOTYPE SPECIES: *Tetrastigma lanceolarium* (Roxb.) Planch. (*Cissus lanceolaria* Roxb.) (vide Boerner in Abh. Naturw. Ver. Bremen 21: 280. 1912).

DISTRIBUTION: Southeastern Asia through Malesia to Australia and eastward to Fiji, where an endemic species terminates the generic range, with about 90 species.

FIGURE 177. *Tetrastigma vitiense*; A, portion of stem with foliage and ♀ inflorescences, × 1/4; B, ultimate cluster of ♀ flowers, × 4; C, ♀ flower, showing calyx, gynoecium, 2 petals, and 2 staminodes, × 20; D, part of infructescence and fruits, × 2. A from Smith 1518, B from Degener 15436, C from Smith 7219, D from Smith 720 (detached fruit from Gillespie 2940).



1. *Tetrastigma vitiense* (A. Gray) A. C. Sm. in Bishop Mus. Bull. **141**:92, as *T. vitiensis*. 1936, in J. Arnold Arb. **36**: 283, as *T. vitiensis*. 1955; J. W. Parham, Pl. Fiji Isl. **154**. 1964, ed. 2. 220. 1972. FIGURE 177.

Cissus vitiensis A. Gray, Bot. U. S. Expl. Exped. **1**: 272. 1854.

Vitis vitiensis Seem. Viti, 434. 1862, Fl. Vit. **44**. 1865; Drake, Ill. Fl. Ins. Mar. Pac. **141**. 1890.

Cayratia vitiensis Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **20d**: 281, 391. 1953, in Mitt. Bot. Staatssamml. München **1**: 353. 1953.

Liana in dense forest or thickets, sometimes in crest thickets, at elevations of 100–1,150 m. The petals are white or greenish white, and the fruit turns from green to black at maturity. Flowers have been obtained between April and June, fruits between June and January.

TYPIFICATION: The type is *U. S. Expl. Exped.* (US 17541 HOLOTYPE), collected in Fiji in 1840. Gray indicated the locality as Mbua Bay ("Sandalwood Bay"), Mbua Province, Vanua Levu, but he also stated that both this species and "*Cissus geniculata*" (i. e. *Cayratia seemanniana*, q. v.) were said to have been from Ovalau in Pickering's manuscript notes. The present species is not otherwise known to occur on Ovalau. In making his new combination *Cayratia vitiensis*, Suessenguth apparently did not examine satisfactory flowers, which are clearly unisexual, the ♀ ones with distinctly lobed stigmas.

DISTRIBUTION: Endemic to Fiji and now known from three or four of the high islands; 26 specimens have been examined.

LOCAL NAMES AND USES: Recorded names are *wa lilisili*, *wa kalou*, *wa kokoko*, *wa kula*, *wa ngondro*, *wamba*, and *wasam*. The stems are sometimes used for binding timbers in house-building, and they may also be roasted, peeled, and then used as cord for binding yams.

REPRESENTATIVE COLLECTIONS: VITI LEVU: M̄BUA: Mountains near Lautoka, *Greenwood 290*; vicinity of Nandarivatu, *Gillespie 3850*; western and southern slopes of Mt. Tomanivi, *Smith 5231*. NANDRONGA & NAVOSA: Northern portion of Rairaimatuku Plateau, between Nandrau and Nanga, *Smith 5485*; Naruku, vicinity of Mbelo, near Vatukarasa, *Degener 15309*. NAMOSI: Between Namuamua and Namosi, *Gillespie 2940*. RA: Mataimeravula, vicinity of Rewasa, near Vaileka, *Degener 15436*. NAITASIRI: Wainamo Creek, near Matawailevu, Wainimala Valley, *St. John 18196*; Sawani-Serea road, *DA 11304*; near Nasinu, *Greenwood 1100*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7219*. VANUA LEVU: M̄BUA: Singasingau Creek, Ndama River headwaters, *DA 15187*; southern portion of Seatovo Range, *Smith 1518*. MATHUATA: Mountains near Lambasa, *Greenwood 606*. THAKAUNDRUVE: Hills west of Korotasere, Natewa Bay, *Smith 1941*. TAVEUNI: Western slope between Somosomo and Wairiki, *Smith 720*.

2. *CAYRATIA* Juss. Dict. Sci. Nat. **10**: 103. 1818; Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **20d**: 277. 1953; A. C. Sm. in J. Arnold Arb. **36**: 282. 1955. Nom. cons.

Tendrillous climbing or creeping shrubs, the tendrils 1–3-times forked, sometimes with terminal adhesive disks; leaves digitately or pedately compound, with 3–12 leaflets; inflorescences axillary or leaf-opposed, sometimes long-pedunculate; flowers ♂, 4-merous; calyx usually truncate; petals free, spreading or reflexed; disk cupuliform or pulvinate, often conspicuous, adnate to base of ovary; ovary 2-locular, the ovules 2 per locule, the style terete, the stigma small; fruit a globose or transversely ellipsoid or obovoid berry, the seeds 2–4, with 1 or 2 ventral cavities and a dorsal, linear chalaza.

TYPE SPECIES: *Cayratia pedata* (Lour.) Juss. ex Gagnepain (*Columella pedata* Lour.).

DISTRIBUTION: Africa and southeastern Asia, including Japan, throughout Malaysia to Australia and eastward in the Pacific to Micronesia and Samoa, with about 45

species. Two species are indigenous in Fiji and one of them extends to Samoa; my 1955 indication of Fiji as terminating the distribution of the genus is therefore to be amended.

The two species known from Fiji agree in having leaflet blades ovate to elliptic, with 5-8 secondary nerves per side, in their lax inflorescences and infructescences about 5-12 cm. in diameter, with pedicels 1-4 mm. long at anthesis and slightly longer in fruit, in having a small calyx about 1-1.5 mm. long and 2 mm. in diameter, and in having obovoid fruits 6-11 mm. in diameter when dried. However, they are readily separable.

KEY TO SPECIES

- Leaves 3-foliolate, very rarely pedately 5-foliolate, the petioles 5-12 cm. long, the petiolules 1-3.5 cm. long (terminal one to 6 cm. long), the leaflet blades papyraceous to subchartaceous, 6-16 × 4-12 cm., deeply inaequilaterally cordate at base (terminal blade rounded at base), obtuse and sometimes minutely apiculate at apex, crenate at margin (crenations 2 or 3 per centimeter, rounded to obtuse, not conspicuously mucronate), persistently tufted-pilose beneath in nerve axils; peduncle of inflorescence and infructescence 1-4 cm. long; petals at anthesis about 3 × 2 mm. 1. *C. seemanniana*
- Leaves pedately 5-foliolate, occasionally 3-foliolate, the petioles 4-9 cm. long, the petiolules 0.5-1.5 cm. long (terminal one to 4 cm. long), the leaflet blades submembranaceous, 4-11.5 × 3-5.5 cm., acute to obtuse at base, acuminate at apex (acumen 1-2 cm. long), unequally and coarsely serrate at margin (teeth 1 or 2 per centimeter, conspicuously mucronate-tipped), glabrous on both sides; peduncle of inflorescence and infructescence 4-9 cm. long; petals at anthesis about 2 × 1.5 mm. 2. *C. acuminata*

1. *Cayratia seemanniana* A. C. Sm. in *Sargentia* 1: 55. 1942, in *J. Arnold Arb.* 36: 282. 1955; *J. W. Parham, Pl. Fiji Isl.* 154. 1964, ed. 2. 220. 1972. FIGURE 178A.

Cissus geniculata sensu A. Gray, *Bot. U. S. Expl. Exped.* 1: 272, p. 1854; non Bl.

Vitis saponaria Seem. in *Bonplandia* 9: 254, nom. nud. 1861. Viti, 434, nom. nud. 1862; A. Gray in *Proc. Amer. Acad. Arts* 5: 316, nom. nud. 1862, in *Bonplandia* 10: 35, nom. nud. 1862; *saponaria* Seem. *Fl. Vit.* 44. 1865; Drake, *Ill. Fl. Ins. Mar. Pac.* 141. 1890; non Benth. (1863), nec *Cissus saponaria* Planch. (1887), nec *Cayratia saponaria* Domin (1912), nec *Cayratia saponacea* Domin ex Guillaumin (1931).

An infrequent liana, inadequately known from low elevation forest. Flowers have been observed only from the type specimen, and fruits in January as well as June.

TYPIFICATION: The first valid publication of the name *Vitis saponaria* was by Bentham (1863), whose taxon was based on Australian collections of R. Brown and MacGillivray (cf. Smith, 1942), despite prior listing of the binomial four times by Seemann and Gray (1861, 1862) for a Fijian plant (*Seemann 76*, which has no status as a type and which Gray stated to be the same as his concept (p. p.) of *Cissus geniculata*). The type of *Cayratia seemanniana* is *Degener 15502* (A HOLOTYPE; ISOTYPES at BISH, K, US), collected in flower and fruit June 10, 1941, at Saulangitua, vicinity of Rewasa, near Vaileka, Ra Province, Viti Levu. Suessenguth (in *Engl. & Prantl, Nat. Pflanzenfam.* ed. 2. 20d: 282. 1953) continued to treat *Cayratia saponaria* (Seem. ex Benth.) Domin as composed of both Australian and Fijian elements, apparently having overlooked my 1942 discussion.

DISTRIBUTION: Endemic to Fiji and known from only four collections, each from a different island (although the Exploring Expedition collection cited below may have been from Ovalau, as noted above in the typification paragraph referring to *Tetra-stigma vitiense*).

LOCAL NAME AND USE: The only report of a local name for this species was that of Seemann (1865) as *waroturotu*. He indicated that pieces of the stem were rendered soft by being cooked on hot stones, when they then produced in water a rich lather that was used for washing hair and destroying vermin. The species does not seem abundant enough to warrant widespread use, but one may note that such a Fijian word as *lisilisi*



FIGURE 178. A, *Cayratia seemanniana*; portion of stem with foliage and infructescences, $\times 1/4$. B-D, *Cayratia acuminata*; B, portion of stem with foliage and an inflorescence, with some developing fruits, $\times 1/4$; C, flower with 2 petals removed, showing anthers (a), disk (d), and developing stigma (s), $\times 20$; D, part of infructescence and fruits, $\times 2$. A from Gillespie 4485, B & C from Whistler 958 (Savai'i), D from Whistler 4690 (Upolu).

(noted above under *Tetrastigma vitiense*) refers to such insects as lice. It is possible, therefore, that the *Tetrastigma* was similarly used, although this has not been recorded. The two species when sterile are superficially similar, but the lateral leaflet blades of *T. vitiense* are acute to obtuse at base, readily distinguishable from those of *Cayratia seemanniana*.

AVAILABLE COLLECTIONS: OVALAU: Vicinity of Levuka, *Gillespie 4485*. MOTURIKI: *Seemann 76* (BM, GH, K). VANUA LEVU: MBUA: Mbua Bay, *U. S. Expl. Exped.* (GH, US).

2. *Cayratia acuminata* (A. Gray) A. C. Sm. in *Sargentia* **1**: 57. 1942; Suesseng. in Engl. & Prantl, *Nat. Pflanzenfam.* ed. 2. **20d**: 282, 391. 1953, in *Mitt. Bot. Staatssamml. München* **1**: 352. 1953; A. C. Sm. in *J. Arnold Arb.* **36**: 282. 1955; J. W. Parham, *Pl. Fiji Isl.* 154. 1964, ed. 2. 220. 1972. FIGURE 178B-D.

Cissus acuminata A. Gray, *Bot. U. S. Expl. Exped.* **1**: 273. 1854; Planch. in *DC. Monogr. Phan.* **5**: 564. 1887.

Vitis acuminata Seem. in *Bonplandia* **9**: 255. 1861, Viti, 434. 1862, *Fl. Vit.* **44**. 1865; Drake, *Ill. Fl. Ins. Mar. Pac.* 141. 1890.

Cissus japonica sensu Reinecke in *Bot. Jahrb.* **25**: 652. 1898; Rechinger in *Denkschr. Akad. Wiss. Wien* **85**: 307. 1910; non Willd.

Liana, occurring at elevations up to about 800 m. in forest, but apparently infrequent. The petals are yellow or cream-colored and the immature fruit is green, doubtless turning black.

TYPIFICATION: *Cissus acuminata* is based on *U. S. Expl. Exped.* (US 17465) HOLOTYPE; ISOTYPE at GH, collected in 1840 on Ovalau. Suessenguth (1953) overlooked my earlier combination; in proposing it anew he suggested the relationship of *Cayratia acuminata* to *C. schumanniana* (Gilg) Suesseng., of New Guinea.

DISTRIBUTION: In considering *Cayratia acuminata* endemic to Fiji (1942, 1955), I failed to investigate the identity of Samoan plants referred to *Cissus japonica* by Reinecke and Rechinger. Their specimens, as well as others more recently collected, seem identical to *C. acuminata*, of which I have now seen ten collections from Savai'i and Upolu. Available Fijian specimens are unsatisfactory, the Samoan material permitting a much better understanding of the species.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, *Degener & Ordonez 13575* (A). NAMOSI: Vicinity of Namosi, *Seemann 77* (K); in 1865 Seemann erroneously listed his collection as from Ovalau, but it is clearly marked as from Namosi.

3. *VITIS* L. *Sp. Pl.* 202. 1753; Suesseng. in Engl. & Prantl, *Nat. Pflanzenfam.* ed. 2. **20d**: 283. 1953; Brizicky in *J. Arnold Arb.* **46**: 61. 1965.

Tendrillous climbing shrubs, usually polygamodioecious, the tendrils forked, without adhesive disks; leaves simple, the blades often lobed and dentate; inflorescences leaf-opposed, paniculate; flowers ♂ or unisexual, 5-merous; calyx subtruncate; petals coherent distally, the calyptra caducous before full anthesis; disk adnate to base of ovary, 5-lobed; ovary 2-locular, the ovules 2 per locule, the style short; fruit a berry with 2-4 seeds, these rostrate at base, with 2 adaxial linear grooves, the dorsal surface with an orbicular chalaza, the raphe filiform.

LECTOTYPE SPECIES: *Vitis vinifera* L. (vide Britton & Brown, *Ill. Fl. N. U. S.* ed. 2. **2**: 505. 1913), one of Linnaeus's seven original species.

DISTRIBUTION: North temperate and subtropical regions, with 50-70 species, several of which are widely cultivated.

1. *Vitis vinifera* L. Sp. Pl. 202. 1753; Seem. Fl. Vit. 45. 1865; Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20d: 295. fig. 82, G-M, 83, a. 1953.

TYPIFICATION: Several prior references were listed by Linnaeus.

DISTRIBUTION: Mediterranean area and the Near East; later taken to the Far East and subsequently to most temperate and subtropical parts of the world. In the Pacific it occurs at least in the Society Islands and Hawaii but doubtless elsewhere. Although no Fijian collections are available, the grapevine is occasionally cultivated in Fiji, although not on a commercial scale. Seemann (1865) noted that it was introduced about 1860 and was growing well in Levuka, Ovalau.

LOCAL NAME AND USES: The *grapevine* is of great commercial importance for wine, fresh fruits and juice, raisins, etc. There are innumerable cultivars and hybrids with related species. A very useful list of references to *Vitis vinifera* and its allies is supplied by Brizicky (in J. Arnold Arb. 46: 65-67. 1965).

FAMILY 154. LEEACEAE

LEEACEAE Dumort. Anal. Fam. Pl. 21, 27. 1829.

Trees or erect or creeping or scrambling shrubs, without tendrils, the stems spiny or unarmed, stipulate, the stipules attached to base of petiole and sheathing, narrow to broad, often early caducous; leaves alternate (rarely opposite), imparipinnate or imperfectly so, often partially bipinnate, sometimes trifoliolate or unifoliolate, the rachis nodose, the leaflet blades crenate to serrate, often with globular or stellate pearl glands beneath; inflorescences leaf-opposed, erect or pendulous, cymose or corymbose, bracteate, many-flowered; flowers ♂, actinomorphic, hypogynous, 4- or 5-merous, haplostemonous; calyx campanulate or cupuliform, the lobes valvate, deltoid; petals valvate, distally cohering in bud by ventrally apical keels, reflexed at anthesis, the basal portions connate to one another and adnate to androecium to form a shortly tubular common structure (paracorolla) free from calyx; stamens opposite petals, the filaments connate (above paracorolla) into a staminodial tube bearing 4 or 5 thickened lobes connate to one another by thinner tissues forming sinuses, the lobes retuse to bifid at apex, the lower portion of staminodial tube forming a usually free, proximally projecting collar, the anther-bearing filaments inserted on paracorolla outside staminodial tube and attached to anthers over sinuses of tube, the anthers 2-locular, introrse (as borne within staminodial tube), dorsifixed, in young flowers syngenesious and inverted within staminodial tube, at anthesis remaining together in a cylinder within tube or separating above it, the tissue joining anthers rupturing or not; ovary ovoid to discoid, 4-8-locular (sometimes incompletely so), the ovules 1 per locule, anatropous, basal, erect, the style short, entire, the stigma slightly thickened; fruit a depressed-subglobose berry, the seeds deltoid-ovate in section, the endosperm ruminant, the embryo linear.

DISTRIBUTION: Southeastern Asia through Malesia to Australia and eastward to Fiji, and also in Africa and Madagascar, with a single genus and 34 species (Ridsdale, 1976). Other authors (e. g. Suessenguth, 1953; Cronquist, 1981) have suggested that there are about 70 species of *Leea*.

USEFUL TREATMENTS OF FAMILY: SUESSENGUTH, K. Leeaceae. Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20d: 372-390. 1953. RIDSDALE, C. E. A revision of the family Leeaceae. Blumea 22: 57-100. 1974. RIDSDALE, C. E. Leeaceae. Fl. Males. I. 7: 755-782. 1976.

FIGURE 179. *Leea indica*; A, inflorescence and lower part of a leaf showing the 2 pinnately divided lower leaflets, $\times 1/4$; B, stipules and stipular scar on petiole, $\times 4$; C, ultimate cluster of flowers, $\times 4$; D, flower with 2 petals removed, showing 2 filaments outside staminodial tube and bases of inverted anthers, $\times 20$. A from Smith 207, B from Smith 846, C & D from Smith 361.



1. LEEA van Royen ex L. Syst. Nat. ed. 12. 627. 1767, Mant. Pl. 17, 124. 1767; Seem. Fl. Vit. 44. 1865; Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20d: 382. 1953; Ridsdale in Blumea 22: 74. 1974, in Fl. Males. I. 7: 755. 1976. Nom. cons.

Characters and distribution of the family. One widespread species extends eastward to Fiji, and the genus should have been recorded in my 1955 paper (in J. Arnold Arb. 36: 283) discussing genera terminating to the east in Fiji. Ridsdale (1974, 1976) notes Tonga (?) in his distribution, but no source of this record is given and no Tongan material of *Leea* is known to me.

LECTOTYPE SPECIES: *Leea aequata* L., typ. cons.



FIGURE 180. *Leea indica*; A, gynoecium (g) and inner surface of staminodial tube spread out, the anthers syngenesious, dehiscent, and inverted, showing broken filaments (f), proximally projecting collar (c) of staminodial tube, and paracorolla (p), $\times 20$; B, part of infructescence and fruits, $\times 2$. A from *Smith 361*, B from *Smith 1553*.

1. *Leea indica* (Burm. f.) Merr. in Philipp. J. Sci. **14**: 245. 1919, Enum. Philipp. Fl. Pl. **3**: 11. 1923; J. W. Parham, Pl. Fiji Isl. 154. 1964, ed. 2. 220. 1972; Ridsdale in Blumea **22**: 95. fig. 4 (6-8), 5 (1-7), 8 (5). 1974, in Fl. Males. I. **7**: 779. fig. 3 (24), 4, e, 23. 1976. FIGURES 179, 180.

Staphylea indica Burm. f. Fl. Ind. 75. t. 24, fig. 2. 1768.

Aquilicia sambucina L. Mant. Pl. Alt. 211, nom. illeg. 1771.

Leea sambucina Willd. Sp. Pl. I: 1177, nom. illeg. 1798; A. Gray, Bot. U. S. Expl. Exped. **1**: 274. 1854; Seem. in Bonplandia **9**: 255. 1861, Viti, 434. 1862, Fl. Vit. 44. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 142. 1890; Gibbs in J. Linn. Soc. Bot. **39**: 143. 1909; Suesseng. in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **20d**: 384. 1953; Backer & Bakh. f. Fl. Java **2**: 94. 1965.

As seen in Fiji, *Leea indica* is a usually slender shrub or small tree 1-15 m. high, with a trunk occasionally 40 cm. in diameter, often frequent in dense or open forest at elevations from near sea level to about 900 m. Indument is lacking or very sparse in Fijian representatives. The large leaves are 2- or 3-pinnate, with the lowest pair of leaflets usually again imparipinnately 3- or 5-foliolate. The individual leaflets vary greatly in size, with blades up to 25 × 10 cm., long-acuminate, and coarsely crenate-serrate. Stipules (as noted in Fiji) are oblong or narrowly obovate, 22-30 × 6-10 mm., leaving a narrowly triangular petiolar scar. The petals and staminodial tube are greenish to white or yellowish, and the fruits, up to 17 mm. in diameter when fresh, are red or purple, at length becoming black, and with black seeds. Flowers occur freely between October and May, but fruits persist throughout the year.

TIPIFICATION: No specimen of *Staphylea indica* was cited by Burman, but it was apparently based on material from Java (Merrill, 1919) and may be typified by Burman's description and illustration. The same figure and description are to be taken as the type of *Aquilicia sambucina*. Although some authors have interpreted *Leea sambucina* (L.) Willd. as distinct from *L. indica*, that binomial is in any case illegitimate, since both Linnaeus (1771) and Willdenow (1798) included Burman's binomial in its synonymy. Ridsdale's treatments (1974, 1976) should be consulted for full synonymy and discussion.

DISTRIBUTION: Ceylon, India, and southern China throughout Malesia to northern Australia and eastward in the Pacific to Fiji. In the latter archipelago it is now known from about 60 collections from seven high islands but may be anticipated on many others.

LOCAL NAMES AND USE: In spite of its abundance, the only recorded names are *tiritau* and *nai mosa ni nduna* (Naitasiri) and *ndomondomotiri* (Kandavu). The stems of small plants are sometimes used as fishing poles.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mountains near Lautoka, *Greenwood 903*; between Nandarivatu and Waikumbukumbu, *Gibbs 695*; Mt. Nanggaranambuluta, east of Nandarivatu, *Gillespie 4362*; Mt. Tomanivi, *DA 2293*. NANDRONGA & NAVOSA: Tonuve, Singatoka Valley, *H. B. R. Parham 157*; vicinity of Mbelo, near Vatukarasa, *Degener 15311*. NAMOSI: Mt. Voma, *DA 11645*. NAITASIRI: Waisiwiwi Creek, Wainimala Valley, *St. John 18252*; upper Waindina River, *MacDaniels 1049*. TAILEVU: Namara, *Seemann 78*, p. p. REWA: Vicinity of Suva, *Yeoward 80*. KANDAVU: Mt. Mbuke Levu, *Smith 207*. OVALAU: U. S. Expl. Exped.; hills east of Lovoni Valley, *Smith 7304*. NGAU: Hills east of Herald Bay, inland from Sawaieke, *Smith 7773*. VANUA LEVU: MBUA: Southern portion of Seatovo Range, *Smith 1553*. MATHUATA: U. S. Expl. Exped. THAKAUNDOVE: Hills south of Nakula Valley, *Smith 361*. TAVEUNI *Seemann 78*, p. p.; western slope between Somosomo and Wairiki, *Smith 846*. MOALA: *Bryan 305*

The species of *Leea* indigenous in Fiji seems properly referred to the widespread and variable *L. indica* as interpreted by Ridsdale (1974, 1976), but it must be noted that its stipules are narrow for the species, being (FIGURE 179B) narrower than 10 mm. and certainly not markedly obovate nor "up to 6 by 4 cm." (Ridsdale, 1976, p. 780) nor leaving a "broadly triangular" scar. However, in respect to other characters of foliage and inflorescence the Fijian population falls into a reasonable concept of *L. indica*, and no other position for it can be found in Ridsdale's meticulous treatments.

ORDER POLYGALALES

KEY TO FAMILIES OCCURRING IN FIJI

Stamens usually 10, the filaments usually basally connate, the anthers dehiscent by longitudinal slits (rarely by terminal pores); petals 5, free, usually unguiculate; ovary usually 3-locular; leaves opposite or verticillate (at least in our species); our representatives trees, shrubs, or lianas.

155. MALPIGHIACEAE

Stamens usually 8, the filaments usually connate into a cleft sheath, the anthers dehiscent by apical pores or short subapical clefts (rarely by longitudinal slits); petals 3 (in our genus), basally adnate to filament tube; ovary usually 2-locular; leaves usually alternate; our representative an adventive herb.

156. POLYGALACEAE

FAMILY 155. MALPIGHIACEAE

MALPIGHIACEAE Juss. Gen. Pl. 252, as *Malpighiae*. 1789.

Shrubs, small trees, or frequently lianas, commonly with indument of unicellular, medifixed, eglandular ("malpighian") hairs, usually stipulate, the stipules often inconspicuous, sometimes large and connate, sometimes lacking; leaves usually opposite, sometimes verticillate or subopposite, simple, the petiole or proximal margins of blade often with a pair of large, fleshy glands, the blade entire (infrequently lobed), often gland-dotted; inflorescences terminal or axillary, panicle or cymose or racemiform, bracteate, the pedicels articulated, bibracteolate; flowers ♂, seldom unisexual by abortion, hypogynous, 5-merous, often obliquely zygomorphic (bilaterally symmetrical), sometimes actinomorphic; sepals free or slightly connate at base, imbricate, often glandular, persistent; petals free, imbricate or contorted, usually unguiculate, the margins often ciliate, dentate, or fimbriate; stamens usually 10 in 2 cycles (sometimes uni- or tricyclic), some of them often without or with abortive anthers, the filaments usually connate at base, the anthers 2-locular (or some of them 1-locular), basifixed or dorsifixed, dehiscent introrsely by longitudinal slits or seldom by terminal pores, the connective sometimes enlarged; disk inconspicuous, infrequently accrescent; ovary (2 or)3(-5)-locular, positioned obliquely to petals, the placentation axile, the ovules 1 per locule, pendulous, hemianatropous, epitropous (with ventral raphe), the styles distinct or only basally connate, rarely fully connate, the stigmas terminal to ventrally subterminal; fruit commonly a schizocarp with winged to nutlike mericarps, these seldom dehiscent, sometimes a nut or a drupe not or tardily separating into mericarps, the seeds with a large, straight to curved embryo, the endosperm none or scanty.

DISTRIBUTION: Pantropical and subtropical, with 55-60 genera and 800-1,200 species. Four genera have been recorded in Fiji, only one of them being represented by an indigenous species.

USEFUL TREATMENTS OF FAMILY: NIEDENZU, F. *Malpighiaceae*. *Pflanzenr.* 91, 93, 94 (IV. 141): 1-870. 1928. JACOBS, M. *Malpighiaceae*. *Fl. Males.* 1. 5: 125-145. 1955. HUTCHINSON, J. *Malpighiaceae*. *Gen. Fl. Pl.* 2: 569-592. 1967.

KEY TO GENERA

Fruits samaroid, winged; our species lianas or plants with scandent branches.

Flowers zygomorphic; calyx (in our species) with a large posterior gland (this in some species more than one or lacking); petals slightly unequal in shape and size, the innermost one often (as in our species) with 2 basal outgrowths; stamens unequal, the anterior one conspicuously the largest and with a stout filament; ovary 3-lobed, with incipient wings early apparent; fruit with 3 laterally developed wings, the middle one the longest and often (as in our species) with a dorsal crest simulating a fourth wing; stipules minute, glandlike, inserted on branchlets between petioles, or lacking; indigenous.

1. *Hiptage*

Flowers essentially actinomorphic; calyx eglandular or with very small glands; petals equal, dorsally carinate; stamens of the two whorls with unequal filaments; ovary globose; fruit with a lateral wing with 4-10 lobes stellately expanding in one plane, a median wing sometimes also present; stipules small, connate to bases of petioles; cultivated only. 2. *Tristellateia*

Fruits smooth, with unwinged mericarps or pyrenes; our species shrubs or small trees; cultivated only.

Leaf blades with 2 small glands at base; flowers essentially actinomorphic; calyx usually eglandular; stamens alternately slightly unequal; ovary often with 1 or 2 of the 3 locules undeveloped; fruit composed of dehiscent mericarps. 3. *Galphumia*

Leaf blades eglandular; flowers zygomorphic; calyx with 6-10 distinct glands; 2 stamens in a transverse plane different from the other 8; ovary 3-locular; fruit a fleshy drupe with 3 subcoherent pyrenes.

4. *Malpighia*

1. *Hiptage* Gaertn. Fruct. Sem. Pl. 2: 169. 1790; Seem. Fl. Vit. 29. 1865; Niedenzu in Pflanzenr. 91 (IV. 141): 67. 1928; A. C. Sm. in J. Arnold Arb. 36: 280. 1955; Jacobs in Fl. Males. I. 5: 130. 1955; Hutchinson, Gen. Fl. Pl. 2: 585. 1967.

Trees or often scandent shrubs or lianas, the stipules minute and glandlike, sometimes lacking, if present free between petioles; leaves opposite, the petioles short, the blades subcoriaceous, entire, usually with 2 basal glands on lower surface, often with smaller, scattered glands beneath; inflorescences terminal and axillary, racemiform or paniculiform, the flowers ♂, dispersed along rachis, zygomorphic; calyx deeply lobed, often with one large posterior gland sometimes decurrent on petiole, the gland convex or (as in our species) concave, in some species lacking or more than one, the lobes obtuse; petals usually obviously unguiculate, slightly unequal in shape and size, the innermost one often with 2 basal outgrowths; stamens unequal, the filaments connate at base, the anterior stamen conspicuously the longest and with a stout filament, the other 9 with slender filaments, the posterior one the shortest; ovary 3-lobed, the incipient wings early obvious and copiously pilose, 2 styles abortive, the remaining style conspicuous, stout, coiled inward and slightly longer than longest stamen, acute, the stigma inconspicuous; fruit samaroid, composed of mericarps and 3 laterally developed wings, these coriaceous to chartaceous, the middle one the longest and at right angles to the 2 lateral ones, a dorsal crest sometimes (as in our species) developing longitudinally on largest wing and simulating a fourth wing, but in some species lacking.

TYPE SPECIES: *Hiptage madablota* Gaertn. (= *H. benghalensis* (L.) Kurz).

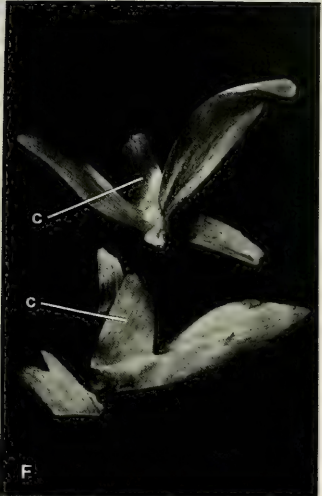
DISTRIBUTION: Ceylon, the Himalayas, southern China, and Formosa into Malaisia to Celebes and Timor, with a disjunct endemic species terminating the generic range in Fiji, with 20-30 species.

1. *Hiptage myrtifolia* A. Gray, Bot. U. S. Expl. Exped. 1: 267. 1854, Atlas, pl. 21. 1856; Seem. Viti, 434. 1862, Fl. Vit. 29. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 127. 1890; Niedenzu in Pflanzenr. 91 (IV. 141): 84. 1928; A. C. Sm. in J. Arnold Arb. 31: 288. 1950, in op. cit. 36: 280. 1955; Jacobs in Fl. Males. I. 5: 135. 1955; J. W. Parham, Pl. Fiji Isl. 122. 1964, ed. 2. 173. 1972.

FIGURE 181.

Hiptage javanica sensu A. Gray, Bot. U. S. Expl. Exped. 1: 267. 1854; Seem. Viti, 434. 1862, Fl. Vit. 29. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 127. 1890; non Bl.

A shrub or small tree 1-4 m. high, usually with scandent branches, or a high-climbing liana, found from near sea level to about 900 m. elevation in dense, dry, or secondary forest or on its edges; branchlets pale-sericeous but soon glabrate, copiously pale-lenticellate; petioles 3-6 mm. long; leaf blades subcoriaceous to chartaceous, prevailing ovate, (2.5-) 4-11 × (1-) 1.5-5.3 cm., obtuse to rounded at base, obtuse to acute at apex (rarely with an acumen to 15 mm. long); inflorescences racemose (but on defoliate branchlets sometimes simulating large, complex panicles), 5-11 (-14) cm. long, the pedicels 5-25 mm. long, articulated and bibracteolate near base (when young) or near middle (at maturity); flowers fragrant; calyx red-tinged, the lobes rounded or obtuse, 2-2.5 × 1.5-2 mm., slightly accrescent and subpersistent in fruit, the calycine gland conspicuous, 2-3 mm. long, concave; petals pink-tinged to pale purple, copiously short-sericeous without, suborbicular, finely erose-fimbriate, the largest ones to 12 × 8 mm.; filaments greenish white, the longest one stout, 6-10 mm. long, the others



slender, 1.5–3 mm. long, the anthers yellow, 1–1.3 mm. long; style greenish white, 7–11 mm. long; fruits pink to red, the wings lanceolate to obovoid or oblong, variable in shape and size, the largest ones up to 4×1.5 cm., the dorsal crest prominent and often nearly as large as smaller wings. Flowers have been observed in April, May, and September to December, fruits in June and October to December.

TYPIFICATION: The material referred by Gray to *Hiptage myrtifolia* was from Ovalau and Vanua Levu, but it is not now possible to tell the locality of individual specimens. Gray's var. α , presumably representing his principal concept of the species, is based on *U. S. Expl. Exped.* (US 14050 HOLOTYPE; putative ISOTYPES at GH, K); var. β , with somewhat larger and thinner leaf blades, is represented by *U. S. Expl. Exped.* (us 14049, GH, K). No reasons are apparent for the maintenance of infraspecific taxa. The source of Gray's concept of *H. javanica* was *U. S. Expl. Exped.* (GH, NY, US), from "Somu-somu and Naiau" (i. e. Taveuni and Nayau). As noted in 1950, I believe these specimens to fall into a reasonable concept of the Fijian endemic.

DISTRIBUTION: Endemic to Fiji and now known from about 35 collections from seven islands, including some in the Lau Group.

LOCAL NAMES: Recorded names, none widely known, are *wa tambua*, *tumbu ni vono*, and *nungairangawa*.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nalotawa, eastern base of Mt. Evans Range, *Smith 4466*; vicinity of Nandarivatu, *Gillespie 4268*. SERUA: Hills between Navua River and Wainiyavu Creek, near Namuamua, *Smith 9013*. NAMOSI: Vicinity of Namosi, *Gillespie 2647*; Nambukavesi Creek, *DA 13840*. NAITASIRI: Nasauvere, Wainimala River, *DA 14026*; vicinity of Nasinu, *Gillespie 3559*. TAILEVU: Near Londoni, *DA 1073*. VITI LEVU without further locality, *Graeffe s. n.* (k, cited as no. 18 by Seemann, 1865). VANUA LEVU: MATHUATA: Near Mbatiri, Ndreketi River, *DA 13581*; vicinity of Lambasa, *Greenwood 506*. THAKAUNDRUVE: Nakoroutari, south of Lambasa, *DA 15236*. VANUA MBA-LAVU: Northern limestone section, *Bryan*, Sept. 20, 1924. KATAFANGA: Northern end of island, *Bryan 541*. FIJI without further locality, *Storck s. n.*, *Horne 949*.

The closest relative (Jacobs, 1955) of *Hiptage myrtifolia* is *H. luzonica* Merr., of the Philippines and Celebes; the Fijian species differs in its very short petioles, its more distinctly ovate and duller leaf blades with obtuse to acute (only rarely somewhat acuminate) apices, and its fruits with a very obvious dorsal crest (very rarely absent), which is always lacking in *H. luzonica*. Gray's original description and illustration can scarcely be improved upon, except that the disparity of filament length is generally greater than indicated by his illustrator.

2. TRISTELLATEIA Thou. Gen. Nov. Madagasc. 14. 1806; Niedenzu in Pflanzern. 91 (IV. 141): 57. 1928; Jacobs in Fl. Males. 1. 5: 136. 1955; Hutchinson, Gen. Fl. Pl. 2: 584. 1967.

Lianas, usually glabrous, the stipules small, connate to base of petiole; leaves opposite or verticillate, the blades entire, usually with 2 marginal glands at base; inflorescences terminal and lateral, racemiform or paniculiform; flowers essentially actinomorphic, $\bar{\sigma}$; calyx eglandular or with very small glands; petals long-unguiculate, oblong or ovate, entire, dorsally carinate; stamens with unequal filaments connate at base, those of the outer whorl the longer and basally the broader; ovary

FIGURE 181. *Hiptage myrtifolia*: A, distal portion of branchlet, with foliage and inflorescences, $\times 1/3$; B, flower, showing calycine gland (g), the petals beginning to separate, disclosing 2 slender, posterior filaments, $\times 6$; C, flower with petals and 6 anthers fallen, showing calycine gland (g), style (s), and filaments of varying lengths, the anterior one (f) much exceeding the others, $\times 6$; D, inner surfaces of 2 petals, the upper one an outer petal, the lower one an inner (posterior) petal with 2 basal outgrowths, $\times 6$; E, flower with petals and 2 sepals removed, showing calycine gland (g), ovary (o) with incipient, copiously pilose wings (w), style (s), and filament (f) of large stamen, $\times 6$; F, ventral and lateral views of fruit, showing the dorsal crest (c) developing longitudinally on the largest wing, $\times 1$. A from *DA 13840*, B–E from *Smith 9013*, F from *Gillespie 3559*.

globose, with 1 (or 2) styles developing, the others abortive; fruit a samaroid mericarp with a coriaceous lateral wing, this with 4–10 lobes stellately expanding in one plane, a median wing sometimes also developing and resembling lobes of the lateral wing.

TYPE SPECIES: *Tristellateia madagascariensis* Poir. (vide Morton in Taxon 17: 324. 1968); ING (1979) indicates the type species as “non designatus.”

DISTRIBUTION: East Africa and (mostly) Madagascar, with one paleotropical species from southeastern Asia to New Caledonia, with about 22 species. One species is occasionally cultivated in Fiji.

1. ***Tristellateia australasiae*** A. Rich. in Dumont d'Urville, Voy. Astrolabe, Atlas, t. 15. 1833, Sert. Astrolab. 38 (descr., as *T. australis*). 1834; Seem. Fl. Vit. 29, as *Tristellaria australasica*. 1865; Niedenzu in Pflanzenr. 91 (IV. 141): 60. 1928; Jacobs in Fl. Males. I. 5: 136. fig. 8. 1955; Fosberg in Micronesica 2: 147. 1966; J. W. Parham, Pl. Fiji Isl. ed. 2. 174, as *T. australis*. 1972.

Tristellateia australasiae, sparingly cultivated near sea level in Fiji, is a liana or climbing vine with yellow petals; the filaments are also yellow but turn dark red. The only available collection was flowering in January.

TYPIIFICATION: Richard mentioned the plant as coming from “port Dorey à la Nouvelle-Guinée,” presumably Dore Baai, Vogelkop Peninsula, West New Guinea.

DISTRIBUTION: Southeastern Asia and Formosa through Malesia to the Caroline Islands, New Ireland, Queensland, and New Caledonia; cultivated elsewhere, in the Pacific at least in the Society Islands and Hawaii. It is presumably a fairly recent introduction into Fiji. Seemann (1865) mentioned only a Barclay collection from New Ireland.

LOCAL NAME AND USE: This very attractive ornamental is locally known as *shower of gold climber*.

AVAILABLE COLLECTION: VITI LEVU: REWA: Suva, in private garden, DA 16094.

3. **GALPHIMIA** Cav. Icon. Descr. Pl. 5: 61. 1799; Niedenzu in Pflanzenr. 94 (IV. 141): 590. 1928; Jacobs in Fl. Males. I. 5: 144. 1955.

Thryallis L. Sp. Pl. ed. 2. 554. 1762; Hutchinson, Gen. Fl. Pl. 2: 573. 1967. Nom. rejic. vs. *Thryallis* Mart. (1829, nom. cons.).

Shrubs, the stipules connate at base of petioles; leaves opposite, the blades entire, with 2 small glands at base; inflorescences terminal and axillary, racemose; flowers ♂, essentially actinomorphic; calyx usually eglandular; petals unguiculate, entire or crenulate; stamens with filaments free or very shortly connate at base, alternately slightly unequal; ovary subglobose, 3-lobed, often with 1 or 2 of the locules undeveloped, the styles free, subulate or filiform, coiled in bud; fruits smooth, the mericarps not winged, dehiscent.

LECTOTYPE SPECIES: *Galphimia glauca* Cav. (vide Cuatrecasas in Webbia 13: 550. 1958; Morton in Taxon 17: 318. 1968); ING (1979) indicates the type species as “non designatus.” For a clarification of conservation of the name *Thryallis* Mart. over *Thryallis* L., cf. Taxon 16: 76. 1967, op. cit. 17: 328. 1968.

DISTRIBUTION: America from southwestern U. S. to Argentina, mostly in Mexico, with 10–12 species, one of which is widely cultivated.

1. ***Galphimia gracilis*** Bartling in Linnaea 13: 552. 1839; Niedenzu in Pflanzenr. 94 (IV. 141): 595. 1928; Jacobs in Fl. Males. I. 5: 144. fig. 14. 1955; J. W. Parham, Pl. Fiji Isl. ed. 2. 173. 1972.

Galphimia glauca sensu Merr. Fl. Manila, 277. 1912; J. W. Parham in Agr. J. Dept. Agr. Fiji 29: 32. 1959; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 111. 1970; non Cav.

Thryallis glauca sensu Merr. Enum. Philipp. Fl. Pl. 2: 383. 1923; et auct.; non Kuntze.

Shrub 1-3 m. high, in Fiji occasionally cultivated near sea level; the petals and filaments are bright yellow, the latter becoming red. Flowers have been noted in March and November.

TYPIFICATION: The type was from a plant cultivated in the Botanical Garden at Göttingen, originally from Mexico.

DISTRIBUTION: Mexico and Central America, now widely cultivated in other tropical areas; in the Pacific it has been obtained at least in the Mariana Islands, New Caledonia, Samoa, Niue, the Cook and Society Islands, and Hawaii, as well as in Fiji.

LOCAL NAME AND USE: The *shower of gold* is a very attractive garden ornamental.

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Suva Botanical Gardens, DA 12096; Suva, along street, DA 12270; Suva, in private garden, DA 16776.

4. MALPIGHIA L. Sp. Pl. 425. 1753; Niedenzu in Pflanzenr. 94 (IV. 141): 611. 1928; Jacobs in Fl. Males. I. 5: 144. 1955; Hutchinson, Gen. Fl. Pl. 2: 576. 1967.

Trees or shrubs, the stipules small, subulate, eglandular; leaves opposite, the petioles short, the blades entire or spinose-dentate, eglandular; inflorescences axillary and terminal, fasciculate or racemiform, sometimes 1-flowered; flowers ♀, zygomorphic; calyx 6-10-glandular; petals unequal, unguiculate, glabrous, fimbriate to entire; stamens shorter than petals, 2 opposite in a transverse plane different from the other 8, the filaments connate at base; ovary glabrous, 3-locular, the styles free, divergent, the posterior one usually abortive; fruit a fleshy drupe composed of 3 pyrenes, these subcoherent, dorsally costate.

LECTOTYPE SPECIES: *Malpighia glabra* L. (vide Small in N. Amer. Fl. 25: 152. 1910), one of Linnaeus's six original species.

DISTRIBUTION: America from southwestern U. S. to Peru, mostly in Central America, with 25-35 species, of which two have been cultivated in Fiji.

KEY TO SPECIES

Small, compact shrub usually less than 2 m. high; leaves often fasciculate, the blades ovate, 0.5-4 × 0.5-2.5 cm., rounded at base, the larger ones spinose-dentate at margin; pedicels 1.2-2 cm. long; petals white to pale pink, 8-12 mm. long; fruits composed of 1 or 2 mericarps or pyrenes 0.7-1 cm. long.

1. *M. coccigera*

Shrub or small tree usually 3-7 m. high; leaves not fasciculate, the blades elliptic, 2.5-7.5 × 1.3-3.5 cm., obtuse to rounded or retuse at apex, entire at margin; pedicels 5-10 cm. long; petals pink, about 8 mm. long; fruits fleshy, 1-2 cm. in diameter, with sour, edible pulp and separable pyrenes.

2. *M. puniceifolia*

1. *Malpighia coccigera* L. Sp. Pl. 426. 1753; Niedenzu in Pflanzenr. 94 (IV. 141): 635. fig. 44, K, L. 1928; Jacobs in Fl. Males. I. 5: 145. fig. 15, 16. 1955; J. W. Parham, Pl. Fiji Isl. ed. 2. 174. 1972.

Shrub 0.3-2 m. high, with stiff branches, infrequently cultivated in Fiji near sea level. The petals are white to pale pink and fimbriate, the anthers are yellow, and the fruits vary from red to orange. Flowers and fruits were observed in March.

TYPIFICATION: The only reference indicated by Linnaeus was to Plumier, Nov. Gen. 46. 1703.

DISTRIBUTION: West Indies; cultivated elsewhere in tropical areas, although in the Pacific I have seen collections only from the Mariana Islands and Hawaii in addition to Fiji, where presumably it was a recent introduction.

LOCAL NAME AND USE: Sometimes known as *Singapore holly* (not recorded in Fiji), *Malpighia coccigera* is an attractive, compact ornamental, said to form good hedges.

AVAILABLE COLLECTION: VITI LEVU: REWA: Lami, in private garden, DA 16449.

2. *Malpighia puniceifolia* L. Sp. Pl. ed. 2. 609. 1762; Niedenzu in Pflanzentr. 94 (IV. 141): 622. 1928; J. W. Parham, Pl. Fiji Isl. 122. 1964, ed. 2. 174. 1972.

Shrub or small tree to 7 m. high, with a trunk to 10 cm. in diameter, introduced into cultivation in Fiji for experimental purposes. The pink petals are fimbriate, and the fruits are subglobose, sulcate, 1–2 cm. in diameter, and red to scarlet. No herbarium material has been located from Fiji.

TYPIFICATION: A number of earlier references were listed by Linnaeus.

DISTRIBUTION: Southern Mexico to Peru and also in the West Indies; often cultivated elsewhere.

LOCAL NAMES AND USES: Introduced into Fiji as *acerola*, the species is also widely known as *West Indian cherry* or *Barbados cherry*. The fruits are edible raw or preserved and are one of the richest sources of vitamin C; the pressed, dried fruit pulp has been used commercially as such a source. The species is also sometimes used as a garden ornamental.

Malpighia puniceifolia is sometimes considered a synonym of *M. glabra* L. (1753) (cf. Purseglove, Trop. Crops, Dicot. 637. 1968; Cronquist, 1981, p. 770), but Niedenzu placed the two taxa in different subgenera, and they are well distinguished by Little, Woodbury, and Wadsworth, *Trees of Puerto Rico and the Virgin Islands* 2: 372, fig. 422, vs. 380, fig. 426. 1974. In the absence of herbarium material one may assume that the plant introduced into Fiji as *acerola*, experimentally for its high vitamin C content, was correctly referred to *M. puniceifolia* by Parham.

FAMILY 156. POLYGALACEAE

POLYGALACEAE R. Br. in Flinders, Voy. Terra Australis 2: 542, as *Polygaleae*. 1814.

Herbs, shrubs, woody vines, or small trees, stipulate or with small stipular glands; leaves alternate, infrequently whorled or opposite, simple, the blades entire; inflorescences terminal or axillary, spicate, racemose, or paniculate, the flowers ♂, hypogynous or perigynous, usually distinctly zygomorphic, each subtended by a bract and 2 bracteoles; sepals (4 or) 5, free and similar or proximally connate and sometimes diverse in size; petals usually basally adnate to filaments, sometimes 5 but often only 3 (2 reduced or suppressed), then the lower median one navicular and distally appendaged; stamens usually 8 (sometimes 3–10), the filaments usually connate into a cleft sheath adnate to petals proximally, the anthers basifixed, (1 or) 2-locular, introrse, dehiscent by apical or subapical pores or short or rarely elongate clefts; disk intrastaminal, annular or represented by nectariferous glands; ovary (1 or) 2(–8)-locular, the placentation axile, the ovules usually 1 per locule, pendulous, anatropous, epitropous, the style simple, sometimes bilobed with one lobe stigmatic, sometimes with a capitate stigma; fruit a loculicidal capsule, nut, samara, or drupe, the seeds often carunculate, sometimes pilose, the embryo straight, the endosperm copious to lacking.

DISTRIBUTION: Pantropical, subtropical, and temperate (indigenously absent from New Zealand and most of the Pacific), with 12–15 genera and about 800 species.

1. *Polygala* L. Sp. Pl. 701. 1753; Adema in Blumea 14: 254. 1966; Hutchinson, Gen. Fl. Pl. 2: 340. 1967; N. Miller in J. Arnold Arb. 52: 271. 1971.

Annual or perennial herbs, usually erect and ascending (rarely shrubs); leaves alternate or whorled, rarely subopposite; inflorescences racemose (as in our species) or corymbose-paniculate; sepals 5, the 2 inner ones (wings) large, petaloid, the 2 abaxial ones small, free or laterally fused, the adaxial one sometimes cucullate; petals 3, the 2 upper (lateral) ones marginally connate to the abaxial one (keel) and basally adnate to filament tube; stamens (6 or) 8, the anther locules laterally confluent, dehiscent by a subapical pore or a short cleft; disk annular or represented by 1 or 2 glands or appendages; ovary compressed contrary to dissepiment, the style usually bilobed, the stigmatic lobe subapical; fruit a thin-walled, compressed, loculicidal capsule, the seeds usually pilose.

LECTOTYPE SPECIES: *Polygala vulgaris* L. (vide Britton & Brown, Ill. Fl. N. U. S. ed. 2: 446. 1913).

DISTRIBUTION: As of the family, with about 500 species. One American species is now a widespread adventive, well established in Fiji.

USEFUL TREATMENT OF GENUS: ADEMA, F. A review of the herbaceous species of *Polygala* in Malesia (Polygalaceae). *Blumea* 14: 253-276. 1966.

1. *Polygala paniculata* L. Syst. Nat. ed. 10. 1154. 1759, Amoen. Acad. 5: 402. 1760; Setchell in Carnegie Inst. Wash. Publ. 341: 79. 1924; Christophersen in Bishop Mus. Bull. 128: 117. 1935; A. C. Sm. in Sargentia 1: 45. 1942; Greenwood in Proc. Linn. Soc. 154: 94. 1943, in J. Arnold Arb. 25: 398. 1944; Yuncker in Bishop Mus. Bull. 184: 44. 1945; J. W. Parham in Agr. J. Dept. Agr. Fiji 19: 103. 1948, in Dept. Agr. Fiji Bull. 35: 41. fig. 15. 1959, Pl. Fiji Isl. 111. 1964, ed. 2. 156. 1972; Adema in *Blumea* 14: 267. fig. 12. 1966; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 170. 1970; St. John & A. C. Sm. in Pacific Sci. 25: 331. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 36, 87. 1972.

Profusely branched herb 15-60 cm. high, abundantly naturalized from near sea level to 1,127 m. as a weed in gardens, canefields, and waste places, along roadsides, on dry hillsides, in thickets, and on the edges of forest; leaf blades sessile, lanceolate, 5-25 × 1-4 mm.; inflorescences copious, slenderly racemose, the rachis to 15 cm. long; wings of calyx and petals white, often pink-tinged; capsule about 3 mm. long, the seeds black, with white hairs. Flowers and fruits occur in all months.

TYPIFICATION: The HOLOTYPE (LINN) is the specimen listed by P. Browne, Hist. Jam. 287, no. 1 (without name). 1756.

DISTRIBUTION: Tropical America from Mexico and the West Indies to Brazil, unintentionally introduced into Java in 1845 or 1846 (Adema, 1966) and now widespread in Malesia, Micronesia, and eastward. East of Fiji specimens are known at least from Samoa, the Wallis Islands, Niue, the Marquesas, and Hawaii (recent, cf. Fosberg & Sachet in Smithsonian Contr. Bot. 21: 18. 1975). Setchell's (1924) note of the species in Samoa in 1920 may indicate its first occurrence in the Fijian Region; Greenwood (1943) first observed it on Vanua Levu in 1923 and on Viti Levu about 1927. The species is rapidly spreading in Fiji, now being known from more than 80 collections from seven islands (doubtless occurring on many others); fortunately it is not a serious weed of cultivation.

LOCAL NAMES AND USES: Often used names are *ai roi ni turanga* (chief's fan), *tekiteki ni ulumatua*, and *senikuila*; locally recorded names are *mindhi* (Yasawas) and *tamoli* (Vanua Mbalavu). The first-listed name indicates common use of the plant as a fly whisk, and it is said to be useful in treating poisonous stings.

REPRESENTATIVE COLLECTIONS: YASAWAS: WAYA: Along Wailevu Creek, *St. John 18084*. VITI LEVU: Mba: Between Lautoka and Nandi, *Greenwood 461A*; Nalotawa, eastern base of Mt. Evans Range, *Smith 4265*; summit of Mt. Nanggaranambuluta, east of Nandarivatu, *DA 2421*. NANDRONGA & NAVOSA: Keiyasi, Singatoka River, *DA 10171*. SERUA: Tokotoko, Navua, *DA 10537*. RA: Pasture Seed and Production Farm, Ndombuilevu, *DA 9520*. NAITASIRI: Vinindawa, *DA 9908*; Nasinu, *Gillespie 3420*. TAILEVU: Ndakuivuna, Wainimbuka River, *Smith 7224*; Wainimbokasi River, *DA 10583*. REWA: Namboro, *DA 5945*; Suva, *DA 12229*. KANDAVU: Hills above Namalata and Ngaloa Bays, *Smith 103*. VANUA LEVU: MBUA: Vicinity of Mbua, *DA 5017*. MATHUATA: Lambasa, *Greenwood 461*. THAKAUNDROVE: West of Valethi, *Bierhorst F91*. TAVEUNI: Waitavala, *DA 8898*. VANUA MBALAVU: Near Lomaloma, *Garnock-Jones 980*. LAKEMBA: Near Tumbou, *Garnock-Jones 880*.

ORDER CORNALES

As the Cornales are interpreted by Takhtajan (1980) and Cronquist (1981), the only included family found in Fiji is Alangiaceae. The Cornales have been enlarged by some modern phylogenists, but none of them exclude Alangiaceae, even though Eyde (1968, cited below) has questioned this position on the basis of anatomical and phytochemical evidence.

FAMILY 157. ALANGIACEAE

ALANGIACEAE DC. Prodr. 3: 203, as *Alangiaeae*. 1828.

Trees or infrequently shrubs or woody vines, sometimes with stellate or peltate indument, sometimes spiny, estipulate; leaves alternate (distichous), the blades simple, entire or lobed, often asymmetric, pinnately or palmately nerved; inflorescences axillary, cymose; flowers ♂, rarely unisexual, actinomorphic, epigynous, the pedicels usually apically articulate and bibracteolate; calyx limb persistent in fruit, the lobes 4-10 or obsolete; petals 4-10, valvate, linear or ligulate, pilose within, sometimes connate proximally, becoming reflexed or revolute after anthesis; stamens in a single whorl, as many as (or one more or one less than) petals or (essentially) 2-4 times as many as petals, the filaments free or slightly connate at base, sometimes basally adnate to petals, pilose within, the connective long, the anthers elongate-oblong, 2-locular, basifixed or dorsifixed, dehiscing by longitudinal, introrse or lateral slits; disk prominent, pulvinate, epigynous; ovary 1 (or 2)-locular, the ovules 1 per locule (or one locule empty), pendulous, anatropous, the style terminal, sometimes (as in our species) divided into 2 elongate, ventrally stigmatic branches, sometimes with a capitate or 2-4-lobed (or pyramidal) or irregularly folded and convoluted stigma; fruit drupaceous, the mesocarp fleshy or spongy, the endocarp crustaceous or subligneous, the pyrenes 1 (or 2)-locular, usually 1-seeded, the embryo large, straight, the endosperm copious.

DISTRIBUTION: Eastern and tropical Asia through Malesia to eastern Australia and Fiji; also in tropical Africa and Indian Ocean islands. The family consists of a single genus, 18-25 species usually being recognized. The Fijian taxon terminates the range of the genus and family to the east.

USEFUL TREATMENTS OF FAMILY: WANGERIN, W. *Alangiaceae*. *Pflanzenr.* 41 (IV. 220b): 1-24. 1910. BLOEMBERGEN, S. The genus *Alangium* in the Netherlands Indies. *Blumea* 1: 241-294. 1935. BLOEMBERGEN, S. A revision of the genus *Alangium*. *Bull. Jard. Bot. Buitenzorg III.* 16: 139-235. 1939. EYDE, R. H. Flowers, fruits, and phylogeny of *Alangiaceae*. *J. Arnold Arb.* 49: 167-192. 1968.

1. *ALANGIUM* Lam. *Encycl. Méth. Bot.* 1: 174. 1783; Wangerin in *Bot. Jahrb.* 38: Beibl. 86: 61. 1906, in *Pflanzenr.* 41 (IV. 220b): 6. 1910; Bloemb. in *Blumea* 1: 241. 1935, in *Bull. Jard. Bot. Buitenzorg III.* 16: 140. 1939; A. C. Sm. in *J. Arnold Arb.* 36: 285. 1955; Hutchinson, *Gen. Fl. Pl.* 2: 49. 1967. *Nom. cons.*

Rhytidandra A. Gray in Proc. Amer. Acad. Arts 3:49. 1853, Bot. U. S. Expl. Exped. 1:302. 1854, in Mem. Amer. Acad. Arts 5: 334. 1855, in Proc. Amer. Acad. Arts 6: 55. 1862; Seem. Fl. Vit. 119. 1866.

Characters and distribution of the family.

TYPE SPECIES: *Alangium decapetalum* Lam., typ. cons. *Rhytidandra* is based on *R. vitiensis* A. Gray, the only original species, published as part of a descriptio generico-specifica.

In his (1939) definitive treatment of *Alangium*, Bloembergen interpreted sect. *Rhytidandra* to include only a single species, *A. villosum* (Bl.) Wangerin, broadening his concept of that species by including within it as subspecies two other taxa that in 1935 he had recognized at the specific level. *Alangium villosum* was considered by Bloembergen in 1939 to include ten subspecies (of which his subsp. *salaccense* is now to be treated as subsp. *villosum*). His discussion of and key to his ten subspecies (pp. 201–202) have apparently convinced subsequent students that *A. villosum* is a natural taxon at the specific level and that differences among the included subspecies “are much smaller than between most of the species of the genus,” although their geographical areas overlap in only one case. Six of the comprised taxa are mentioned as “either members of a group of closely allied and little-different species, or geographical varieties of one, or perhaps two, polymorphous species. As intermediate forms between them are hitherto absent, one would be justified in regarding them as good species.” His conclusion to treat the ten taxa as subspecies is no doubt sound, but nevertheless differences are apparent and geographic stabilization has been taking place. Subspecies *vitiense*, as defined by Bloembergen, is characterized by its long flowers (12.5–17.5 mm. long) and essentially glabrous habit, features which in combination it shares only with subsp. *polyosmoides* (F. v. Muell.) Bloemb., of eastern Australia. From the latter, subsp. *vitiense* is said to differ in its broader leaf blades, its petals loosely coherent only in the basal 1 mm. (actually they are free to base at anthesis) (as contrasted to 4–8 mm.), its short filaments (2.25–4 mm. long as contrasted to 4.5–8.5 mm.), its long anthers (5.5–10 mm. long as contrasted to 3.5–5 mm.), and its glabrous style (rather than with soft-pilose longitudinal stripes). The opinion of Bloembergen that such differences merit only subspecific recognition is certainly not lightly to be disputed, in view of his great experience with the genus as a whole, but nevertheless the characters mentioned are of such a nature and consistency that many students of other genera would construe them of specific value, in view of the geographic separation of the two populations. This course is here followed, with the reservation that some future reconsideration of the genus (or at least of sect. *Rhytidandra*) could readily reinstate Bloembergen’s decision. The good distinctions between the Fijian population and Malesian–Australian populations (including *A. polyosmoides* F. v. Muell.) were also emphasized by Gillespie’s discussion of *A. vitiense* in 1932 (cited below).

Eyde’s (1968) discussion of *Alangium* is particularly welcome for its clarification of the interrelationships of the four sections of the genus proposed by Bloembergen (1939). The Fijian population of the genus falls into sect. *Rhytidandra*, characterized by having two styles (as interpreted by Eyde) basally united for about half their length, each stigmatic along its ventral surface and slightly bifid at its apex. This section also has a unilocular ovary (as do sects. *Conostigma* and *Alangium*, only some species of sect. *Marlea* having bilocular ovaries).

1. *Alangium vitiense* (A. Gray) Baill. ex Harms in Engl. & Prantl, Nat. Pflanzenfam. III. 8: 262. 1898; Wangerin in Pflanzenr. 41 (IV. 220b): 19, p. 1910; Gillespie in Bishop Mus. Bull. 91: 23. fig. 26. 1932; J. W. Parham, Pl. Fiji Isl. 83. 1964.

FIGURE 182.

Rhytidandra vitiensis A. Gray in Proc. Amer. Acad. Arts 3: 50. 1853, Bot. U. S. Expl. Exped. 1: 303. 1854, Atlas, pl. 28. 1856, in Proc. Amer. Acad. Arts 6: 55. 1862; Seem. Viti, 436. 1862, Fl. Vit. 119. 1866, op. cit. 429, p. p. 1873.

Marlea vitiensis Benth. Fl. Austral. 3: 386, quoad basionymum. 1867; J. W. Parham, Pl. Fiji Isl. 150. 1964, ed. 2. 213. 1972.

Stylidium vitiense F. v. Muell. Syst. Census Austr. Pl. 74, quoad basionymum. 1882; Drake, Ill. Fl. Ins. Mar. Pac. 184. 1890.

Karangolum vitiense Kuntze, Rev. Gen. Pl. I: 273. 1891.

Alangium villosum subsp. *vitiense* Bloemb. in Bull. Jard. Bot. Buitenzorg III. 16: 208. fig. 6, i, 7, r, s. 1939; A. C. Sm. in J. Arnold Arb. 36: 285. 1955; J. W. Parham, Pl. Fiji Isl. ed. 2. 125. 1972.

Tree 4-24 m. high, often noted as a slender or spreading, found in dense or open forest or on its edges from near sea level to an elevation of 1,150 m.; young parts and inflorescences minutely cinereous-sericeous but the vegetative indument evanescent; petioles 7-18 mm. long; leaf blades oblong-elliptic to ovate, (6-) 7-20 × (3-) 4-9.5 cm., usually strongly inaequilateral at base (the longer side rounded, the shorter side acute to obtuse, both sides infrequently subequal and obtuse), obtuse to broadly acuminate at apex; inflorescences 3-5 cm. long at anthesis (infructescences sometimes to 7 cm. long), with 5-15 flowers; pedicels (i. e. above penultimate articulation) to 6 mm. long at anthesis and sometimes to 10 mm. long in fruit; flowers 6- or 7-merous, with white to pale yellow petals and stamens; calyx (including limb) 4-5 mm. long at anthesis, slender, the limb 1-1.5 mm. long, truncate or with obscure teeth less than 0.2 mm. long; petals in mature flowers free to base and from filaments, 12-15 mm. long, 1-1.5 mm. broad; stamens as many as petals, 10-14 mm. long, the filaments free, 2-4 mm. long and 0.3-0.5 mm. broad, the anthers 8-11 mm. long; style glabrous, 8-11 mm. long including stigmatic branches, these usually 3-4 mm. long; fruits purple, becoming black at maturity, ellipsoid or ovoid, slightly flattened, 13-20 × 8-12 mm., the endocarp copiously pitted, the pits apparent through the dried mesocarp. Flowers and fruits have been obtained in practically all months.

TIPIFICATION: The type is *U. S. Expl. Exped.* (US 62249 HOLOTYPE; ISOTYPES at GH, NY), collected in 1840 in Fiji without further locality. A second sheet (US 62248) is in fruit and bears in Gray's hand the inscription "*Rhytidandra vitiensis* n. sp. fruit (found Oct. 1862)." It is evident that Gray did not have this sheet when preparing his description, and hence it cannot be considered part of the type.

DISTRIBUTION: Endemic to Fiji, as here considered; I have examined 50 collections from nine Fijian islands, including three in the Lau Group.

LOCAL NAMES AND USES: *Teinivia*, *kau ni sau*, and *ai ula ni sala* have been recorded from upland Viti Levu; other names are *meme* (Mba); *kainisinga* (Nandronga & Navosa), *ndranga* (Ra), *na wiwi* (Naitasiri), and *titilairo* (southern Lau). The leaves are reported to be pounded and mixed with coconut oil to make a black dye, and the saplings are used as digging sticks for planting.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Western slopes of Mt. Nanggaranambuluta, east of Nandarivatu, *Smith* 6320; western and southern slopes of Mt. Tomanivi, *Smith* 5249. NANDRONGA & NAVOSA: Nausori Highlands, *DA* 14906; vicinity of Singatoka, *Greenwood* 7. SERUA: Nambukelevu, upper Navua River, *DA* 15664; vicinity of Namboutini, *DA* 14006. NAMOSI: Slopes of Mt. Voma, *Gillespie* 2822. RA: Vicinity of Rewasa, near Vaileka, *Degener* 15500. NAITASIRI: Wainisavulevu Creek, Wainimala River tributary, *St. John* 18289. OVALAU: Hills southeast of valley of Mbureta River, *Smith* 7409; near Levuka, *Degener & Ordóñez* 13792. KORO: Eastern slope of main ridge, *Smith* 1002. NGAU: Hills east of Herald Bay, inland from Sawaieka, *Smith* 7748. VANUA LEVU: MBUA: Southern portion of Seatovo Range, *Smith* 1566. MATHUATA: Seanggangga area, *DA* 12274. THAKAUNDROVE: Nakoroutari, south of Lambasa, *DA* 15237; vicinity of Mbangasau, Natewa Peninsula, *DA* 13957. TAVEUNI: Western slope between Somosomo and Wairiki, *Smith* 845; vicinity of Wairiki, *Gillespie* 4756. VANUA MBALAVU: Northern limestone section, *Smith* 1475. KAMBARA: On limestone, *Smith* 1235. FULANGA: On limestone, *Smith* 1128.



FIGURE 182. *Alangium vitiense*: A, distal portion of branchlet, with foliage and inflorescences prior to anthesis, $\times 1/3$; B, flower with 3 petals and 3 stamens removed, $\times 3$; C, central part of flower with calyx limb, 3 petals, and 3 stamens removed, showing disk, style distally divided into stigmatic branches, filaments, and lower parts of anthers, $\times 8$; D, infructescence, $\times 1$. A from *Smith 845*, B & C from *Smith 1475*, D from *St. John 18289*.

The geographically nearest described taxon to *A. vitiense* is *A. villosum* subsp. *solomonense* Bloemb., which sharply differs from the Fijian taxon in having its leaf blades lanceolate-elliptic (9–13 × 3–5.5 cm.) and nearly aequilaterally attenuate at base; its mature fruits do not have the endocarp as deeply or profusely pitted as that of *A. vitiense* (cf. Gillespie, 1932, fig. 26, b, and Eyde, 1968, fig. 8, v–y). Mature flowers of the Solomon Islands taxon are not at hand, but they will presumably prove smaller than those of *A. vitiense*.

For the time being I exclude Guillaumin's concept (in J. Arnold Arb. 14: 57. 1933) of *A. vitiense* from that taxon; as represented by *Kajewski* 770, from Aneityum, the New Hebridean taxon has larger leaf blades less obviously inaequilateral at base, and its calyx is more abruptly expanded into a limb 2–2.5 mm. long with more obvious teeth (0.3–0.5 mm. long).

ORDER SANTALALES

The Santalales, composed of six or seven families, are a natural order characterized by progressive adaptation to parasitism and the development of a specialized absorbing organ, the haustorium, that attaches to the roots, stems, or branches of other plants and permits the parasite to obtain water and nutrients. The calyx is greatly reduced in some santalalean families and absent in others, the stamens are usually fixed in number, and the ovules are few, often borne on free central placentas and in advanced members lacking, the embryo sacs being embedded in the placenta or in ovarian papillae. In some members of the order the fruits are eaten by a great variety of birds, this fact perhaps accounting for the wide Pacific distributions of certain taxa and an absence of marked geographic speciation.

The family Balanophoraceae, sometimes included in Santalales (Hutchinson, 1973; Cronquist, 1981), is now frequently placed in a different but related order (Takhtajan, 1980), although any close relationship to Santalales is highly questionable (Kuijt, 1968).

USEFUL TREATMENT OF ORDER: KUIJT, J. Mutual affinities of santalalean families. *Brittonia* 20: 136–147. 1968.

KEY TO FAMILIES OCCURRING IN FIJI

- Terrestrial plants, appearing autotrophic but usually hemiparasitic on roots of other plants; ovary 1- or 3–12-locular (then the partitions incomplete distally), the ovules well differentiated from placenta (except in *Exocarpos*, Santalaceae); fruit a drupe or nut, the seed not surrounded by or capped by viscid tissue.
- Leaves alternate; flowers dichlamydeous; stamens 1–3-seriate, 4–15 in number (in our taxa either as many as or twice as many as petals); seed with a thin testa (or none). 158. OLACACEAE
- Leaves in our taxa usually opposite; flowers monochlamydeous; stamens as many as and opposite tepals; seed without a differentiated testa. 159. SANTALACEAE
- Epiphytic parasites (all our taxa); stamens as many as and opposite petals or tepals (or confluent into a synandrium); ovary inferior, 1(–4)-locular, with or without a free central placental column (mamelon), the ovules absent as recognizable entities, the sporogenous tissue confined to the mamelon or adjacent tissue; fruit baccate (in our taxa), the seeds without a testa, partially or completely surrounded by viscid tissue; leaves in our taxa opposite or reduced to small scales or absent.
- Leaves well developed (as in our taxon) or sometimes reduced; flowers usually ♂ (as in our genus), dichlamydeous, the calyx represented by a calyculus at apex of ovary, the petals comparatively large and showy; stamens obvious, the anthers in our taxon basifixed; style in our genus obvious. 160. LORANTHACEAE
- Leaves (in our taxa) absent or reduced to minute scales, sometimes well developed; flowers unisexual, monochlamydeous, the tepals 2–4 (3 in our genus and minute); stamens in our genus connate into a synandrium emitting pollen from an apical pore; style in our genus none, the stigma umbonate. 161. VISCACEAE

FAMILY 158. OLACACEAE

OLACACEAE Mirbel ex DC. Prodr. 1: 531, as *Olacineae*. 1824.

Terrestrial trees or shrubs, rarely woody vines, most taxa hemiparasitic on roots of other plants, estipulate; leaves alternate, simple, the blades entire, mostly pinnate-veined; inflorescences axillary (rarely borne on old wood), fasciculate, the fascicles often aggregated into racemes or panicles; flowers actinomorphic, ♀ (rarely unisexual, the plants then monoecious or androdioecious), hypogynous to semi-epigynous, rarely epigynous or perigynous; calyx usually cupuliform, inconspicuously 3-7-dentate or -lobed or with obsolete teeth, often accrescent in fruit; petals 3-7, valvate, free or proximally connate; stamens 1-3-seriate, 4-15 in number, rarely in part staminodial, the filaments free, distinct or sometimes adnate to bases of petals or connate into a sheath, the anthers 2-locular (rarely 1-locular), basifixed or medifixed, dehiscing by longitudinal slits; disk intrastaminal and surrounding ovary (this sometimes sunk into disk) or extrastaminal and annular or represented by glands alternate with petals or lacking; ovary superior to inferior, 1- or 3-5(-7)-locular, if 1-locular with 2 or 3 (-7) ovules on a free central placenta, if 3-5(-7)-locular with partitions incomplete distally and with a single dependent ovule from each inner angle, the placentation free central to axile, the ovules usually anatropous, the style conical to filiform or essentially none, the stigma 3-5-lobed or -partite; fruit a 1-seeded drupe, sometimes included within the accrescent calyx or within the accrescent disk, the pericarp sometimes dehiscent, the endocarp crustaceous to woody, the seed with a thin testa (or none), the embryo small, the endosperm copious.

DISTRIBUTION: Pantropical and subtropical, with about 25 genera and 170-200 species. Two genera, each with a single indigenous species, occur in Fiji.

USEFUL TREATMENTS OF FAMILY: SLEUMER, H. *Olacaceae*. Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **16b**: 5-32. 1935. SLEUMER, H. A taxonomic account of the Olacaceae of Asia, Malesia, and the adjacent areas. *Blumea* **26**: 145-168. 1980. BAAS, P., E. VAN OOSTERHOUD, & C. J. L. SCHOLTES. Leaf anatomy and classification of the Olacaceae, *Octoknema*, and *Erythralium*. *Allertonia* **3**: 155-210. 1982. SLEUMER, H. *Olacaceae*. *Fl. Males.* **1**: 1-29. 1984.

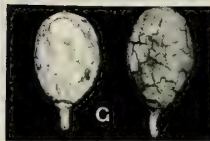
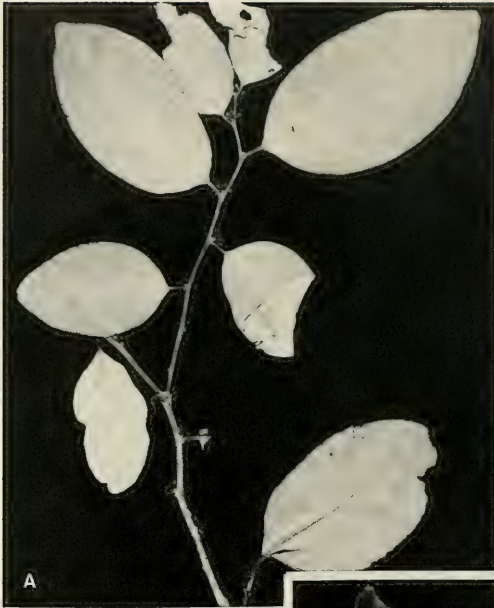
KEY TO GENERA

- Flowers usually 6-merous; petals proximally connate, carnosae, each with a proximal cavity including a stamen, the stamens as many as petals, the filaments shortly ligulate; disk present, adnate to ovary, accrescent in fruit to enclose drupe nearly to apex; our species occurring in interior forest, the branches not spiny. 1. *Anacolosa*
 Flowers usually 4-merous; petals free, becoming distally revolute, the stamens twice as many as petals, the filaments filiform; disk lacking; our species often with spiny branches, occurring only near sea level. 2. *Ximena*

1. *ANACOLOSA* Bl. Mus. Bot. Lugd.-Bat. **1**: 250. 1851; Sleumer in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **16b**: 20. 1935, in *Fl. Males.* **1**: 23. 1984.

Stemonurus sect. *Anacolosa* Bl. *Bijdr. Fl. Ned. Ind.* 649. 1826.

Trees or shrubs (rarely scandent); leaves short-petiolate, the blades pinnate-nerved; inflorescences fasciculate or cymose, compact, usually sessile, axillary or borne on old wood; flowers ♀, (5 or)6(or 7)-merous; calyx subtruncate or short-dentate, not accrescent; petals borne on margin of the cupuliform disk, carnosae, proximally connate and concave, carinate and barbate above cavity; stamens as many as petals and included within their cavities, the filaments shortly ligulate, the anthers broadly ovoid, the locules separated by the thickened connective, this usually pilose at apex; disk adnate to ovary; ovary incompletely 2(or 3)-locular proximally, the placenta free central with 2 (or 3) pendent ovules from its apex, the style short, thick-based, the stigma inconspicuously lobed; drupe enclosed in accrescent disk nearly to apex, with an apical style remnant, the pericarp thin-carnosae, the endocarp crustaceous, often conspicuously tuberculate.



TYPE SPECIES: *Anacolosia frutescens* (Bl.) Bl. (*Stemonurus frutescens* Bl.).

DISTRIBUTION: Paleotropical, from central Africa, Madagascar, and southeastern Asia through Malaysia and eastward to Samoa and Tonga, with 15–20 species, one of which is indigenous in Fiji.

1. *Anacolosia lutea* Gillespie in Bishop Mus. Bull. **91**: 5, fig. 3. 1932; A. C. Sm. in J. Arnold Arb. **31**: 154. 1950; Yuncker in Bishop Mus. Bull. **220**: 104. 1959; J. W. Parham, Pl. Fiji Isl. 150. 1964, ed. 2. 214. 1972; Sleumer in Blumea **26**: 148. 1980.

FIGURE 183A–F.

An often slender tree 3–28 m. high or a slender shrub, found at elevations of 50–1,000 m. in dense, dry, or open forest. The calyx is pink-tinged, the petals are white to pink-tinged, and the fruit is at first yellow to pink or orange, at length becoming dark red and more than 3 cm. long at maturity. Flowers and fruits have been obtained throughout the year.

TYPIFICATION: The type is *Gillespie 4040* (BISH HOLOTYPE; ISOTYPE at K), collected Nov. 25, 1927, in the vicinity of Nandarivatu, Mba Province, Viti Levu.

DISTRIBUTION: Fiji and Tonga. Although the species is moderately common in Fiji (now known from 33 collections from four of the high islands), it seems to have been overlooked by early collectors, the first available specimens being those of Greenwood, Tothill, and Gillespie.

LOCAL NAMES: Fijian names have been noted only twice: *sapirewa* (Mba), and *kau maikita* (Namosi).

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nandarivatu, *Tothill 676*; slopes of Mt. Nanggaranambuluta, east of Nandarivatu, *Gillespie 4377*; valley of Nggaliwana Creek, vicinity of Navai, *Webster & Hildreth 14126*. SERUA: Hills between Wainingere and Waisee Creeks, between Ngaloa and Wainiyambia, *Smith 9525*. NAMOSI: Hills north of Wainavindrau Creek, between Korombasambasanga Range and Mt. Naitarandamu, *Smith 8506*; northern slopes of Korombasambasanga Range, in drainage of Wainavindrau Creek, *Smith 8707*. NAITASIRI: Central road, *Tothill 196*. TAILEVU: Hills east of Wainimbuka River, vicinity of Ndakuivuna, *Smith 7121*. REWA: Mt. Korombamba, *DA 1279*. KORO: Eastern slope of main ridge, *Smith 947*. VANUA LEVU: MATHUATA: Seanggangga area, *DA 11910*; vicinity of Lambasa, *Greenwood 484*. THAKAUNDRIVE: Southwestern slope of Mt. Mbatini, *Smith 625*; hills between Vatukawa and Wainigio Rivers, Ndrekeniwai Valley, *Smith 582*. TAVEUNI: Western slope between Somosomo and Wairiki, *Smith 914*.

At first comparison one may be inclined to doubt the separation of the Samoan taxon (*Anacolosia insularis* Christophersen in Bishop Mus. Bull. **128**: 80, fig. 9. 1935) from *A. lutea*, of Fiji and Tonga. Foliage differences are not consistent, although Samoan plants tend to have more frequently lanceolate leaf blades with lower secondary nerves more sharply ascending. Both taxa have the pedicels and calyces varying from glabrous to puberulent (cf. FIGURE 183B & C). Fruits apparently provide dependable characters, although too few are available from Samoa to make even them entirely satisfactory. Nevertheless, it would appear that Sleumer (1980) may be followed in distinguishing between these two easternmost taxa of the genus. The following key compares them.

FIGURE 183. A–F, *Anacolosia lutea*; A, distal portion of branchlet, with foliage and inflorescences, $\times 1/3$; B, young flower, with 3 petals removed, $\times 10$; C, mature flower, with 4 petals and 2 stamens removed, $\times 10$; D, young flower, with part of calyx, 3 petals, and 2 stamens removed, showing disk, upper part of ovary with inconspicuous longitudinal grooves, and thick-based style, $\times 20$; E, petal and stamen, $\times 20$; F, mature fruits, $\times 1$. G, *Anacolosia insularis*; fruits, for comparison, the accrescent disk and exocarp partly weathered, showing comparatively smooth endocarp, $\times 1$. A & B from *Smith 625*, C–E from *Smith 582*, F from *Smith 8707* (upper fruit) and *8506* (lower fruits), G from *Christophersen 3312*, Sava'i, Samoa.

Petioles 3–13 mm. long; leaf blades ovate to oblong-elliptic or lanceolate-oblong, (5–) 6–17 × (2.5–) 3–9.5 cm., the secondary nerves (3–) 5 or 6 per side, arcuate-ascending, the lower one or two pairs infrequently sharply ascending; pedicels at anthesis 2–3 mm. long, those of mature fruits 7–13 (–20) mm. long; mature fruits (FIGURE 183F) 15–32 × 10–16 mm., soon completely glabrous, ovoid to obovoid, often abruptly contracted and flattened near apex and then projecting into a conspicuous tip formed by the apex of the accrescent disk closely investing the style (or merely obtuse at apex), the aperture formed by the accrescent disk 2–4 mm. in diameter, the obtuse styler remnant projecting 1–3 mm. above the aperture, the endocarp strongly and irregularly tuberculate, its irregular surface clearly apparent through the investing pericarp; Fiji and Tonga. *A. lutea*

Petioles 5–10 mm. long; leaf blades lanceolate-elliptic or oblong-elliptic, (6–) 8–14 × (2.5–) 3–6.3 cm., the secondary nerves 3 or 4 (or 5) per side, the lower one or two pairs usually sharply ascending; pedicels at anthesis 1–1.5 mm. long, those of mature fruits 4–6 mm. long; mature fruits (FIGURE 183G) 10–18 × 10–12 mm., apparently persistently puberulent, ellipsoid, the aperture formed by the accrescent disk 2–3 mm. in diameter, the minutely conical style remnant projecting 0.5–1 mm. above the aperture, the endocarp nearly smooth and not causing protuberances in the investing pericarp; Samoa.

A. insularis

2. *XIMENIA* L. Sp. Pl. 1193. 1753; Seem. Fl. Vit. 38. 1865; Sleumer in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **16b**: 22. 1935, in Fl. Males. I. **10**: 10. 1984.

Trees or shrubs, the branches often with axillary spines; leaves sometimes fasciculate on short shoots, the blades pinnate-nerved; inflorescences axillary or borne on short shoots, fasciculate or umbelliform-cymose; flowers ♂ (rarely functionally unisexual), 4 (or 5)-merous; calyx cupuliform, short-dentate, not or scarcely accrescent; petals linear-oblong, free, becoming distally revolute, pilose within; stamens twice as many as petals, free, the filaments filiform, the anthers linear-oblong or ovate, basifixed, the connective distally produced; disk lacking; ovary superior, (3 or) 4-locular, the ovules 1 per locule, the style filiform or proximally gradually swollen into the ovary, the stigma small, capitate; drupe superior, the pericarp thin, pulpy, the endocarp crustaceous or subligneous.

LECTOTYPE SPECIES: *Ximenia americana* L. (vide Britton & Millspaugh, Bahama Fl. 112. 1920), one of the two original species.

DISTRIBUTION: Pantropical and subtropical, with 8–10 species. One widespread, polymorphic species occurs in Fiji.

1. *Ximenia americana* L. Sp. Pl. 1193. 1753; Benth. in London J. Bot. **2**: 231. 1843; Drake, Ill. Fl. Ins. Mar. Pac. 137. 1890; Guillaumin in J. Arnold Arb. **14**: 55. 1933; Sleumer in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **16b**: 23. fig. 11. 1935; Christophersen in Bishop Mus. Bull. **128**: 80. 1935; Yuncner in op. cit. **220**: 105. 1959; J. W. Parham, Pl. Fiji Isl. 150. 1964, ed. 2. 215. 1972; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. **85**: 85. 1972; Sleumer in Blumea **26**: 166. 1980, in Fl. Males. I. **10**: 11. fig. 4. 1984. FIGURE 184.

Ximenia elliptica Forst. f. Fl. Ins. Austr. Prodr. 27. 1786; A. Gray, Bot. U. S. Expl. Exped. **1**: 305. 1854; Seem. in Bonplandia **9**: 255. 1861, Viti, 434. 1862, Fl. Vit. 39. 1865.

Tree 3–6 m. high, sometimes spreading, often gnarled, the branches often (but not always) with thorns, found only near sea level on rocky shores, in thickets, and on the inner edges of mangrove swamps. The sometimes fragrant flowers have the petals white-barbate within. The fragrant fruit turns from green to dull yellow or orange at maturity. Flowers have been noted in January and May (but this is inconclusive), while fruits persist more or less throughout the year.

LECTOTYPIFICATION: *Ximenia americana* may be lectotypified by *Hort. Clifford*. 483 (BM LECTOTYPE), from tropical America, cf. Lucas in Fl. Trop. E. Afr. Olac. 5. 1968; Sleumer, 1980, p. 167. The type of *X. elliptica* is noted by Sleumer (1980, p. 167) as a Forster collection (B, K) from New Caledonia; I did not locate any Forster material of it at BM, where there is a collection by Anderson, which is conceivably the more appropriate lectotype.

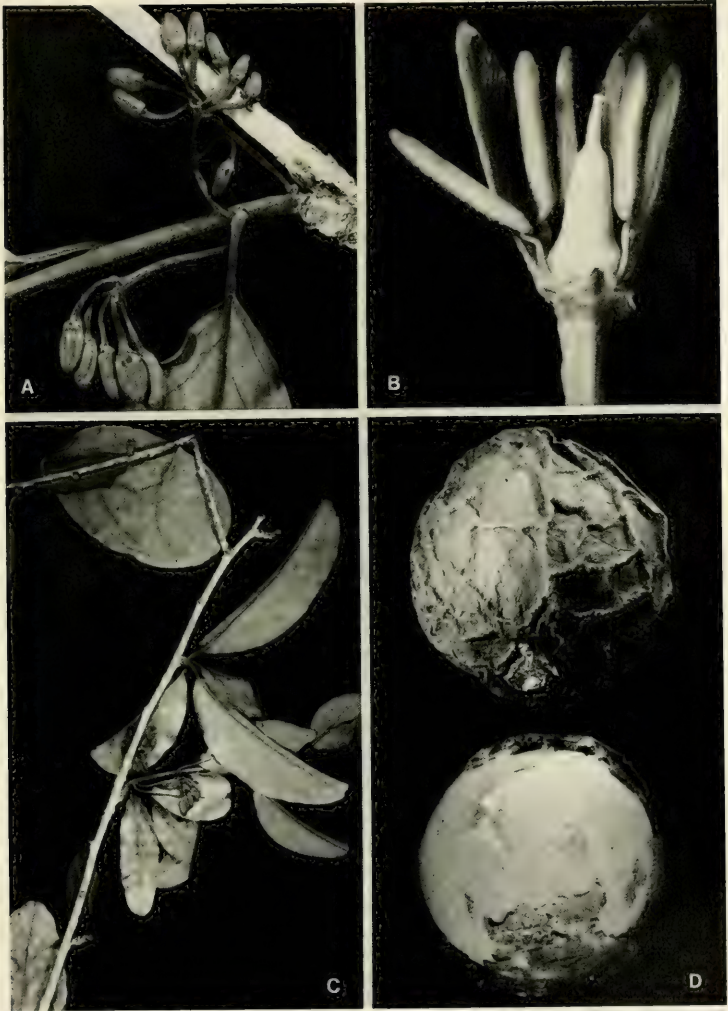


FIGURE 184. *Ximenia americana*: A, inflorescences, $\times 2$; B, flower, with 2 petals and 2 stamens removed, $\times 8$; C, distal portion of branchlet, with foliage and inflorescences, $\times 1/2$; D, fruits, the upper one showing the wrinkled, dried pericarp and the scar of the pedicel attachment, the lower one with most of the pericarp weathered away, showing the smooth endocarp with an apical mucro, $\times 2$. A-C from DA 15291, D from Smith 7898 (upper) and Bryan 301 (lower).

DISTRIBUTION: India and Ceylon to Australia and into the Pacific to the Tuamotus; also in tropical and subtropical America and Africa. The pyrenes are known to float in seawater for months, aided by a layer of air-bearing tissue inside the putamen (Guppy, Obs. Nat. Pac. 2: 113, 529. 1906). If the species is further divided, the Pacific material is referable to var. *americana*.

LOCAL NAMES AND USES: *Somisomi*, *sosomi*, *tomitomi*, *tumitumi*, *misimisi*, and *molimoli*; the last usually refers to *Citrus* and is probably suggested by the spherical, orange fruits. The pericarp of the fruit is edible, having the fragrance and taste of almonds. The wood was used by Fijians for making headrests, and the plant (bark?) is said to be part of an internal remedy for thrush.

AVAILABLE COLLECTIONS: VITI LEVU: NADRONGA & NAVOSA: Thuvu, west of Singatoka, *Greenwood 680A*. TAILEVU: Near Ngegelekuro, *DA 13613*; Matavatathou, Queen Victoria School, *DA 15363*. REWA: Nukulau Island, *Barclay 3462*, *Hinds*. MBENGGGA: Lalati, *Weiner 195*. NGAU: Nggarani, *Tothill 69a*; shore of Herald Bay, near Sawaieke, *Smith 7898*. VANUA LEVU: MATHUATA: *Seemann 88*, p. p.; Nakuthi Island, off mouth of Ndreketi River, *DA 15291*; Nanduri, *DA 13512*; islands along coast, *Greenwood 680*. THAKAUNDROVE: *Seemann 88*, p. p.; Maravu, near Salt Lake, *Degener & Ordenez 14238*. MOALA: *Bryan 301*; north coast, *Smith 1392*. THIKOMBIA-I-LAU: *Tothill 69*. LAKEMBA: Near Tumbou Jetty, *Garnock-Jones 793*. FIJI without further locality, *U. S. Expl. Exped., Horne 1036, DA 3306*.

FAMILY 159. SANTALACEAE

SANTALACEAE R. Br. Prodr. Fl. Nov. Holl. 350. 1810.

Shrubs, trees, or perennial herbs, hemiparasitic on roots (rarely on branches) of other plants, estipulate; leaves opposite or infrequently alternate, simple, sometimes reduced to scales, the blades if developed entire; inflorescences axillary, diverse (racemose, spicate, capitate, etc.), often with bracts subtending a small dichasium or 3-flowered cyme; flowers actinomorphic, ♂ or unisexual (plants then monoecious or dioecious), hypogynous or perigynous to epigynous, monochlamydeous (calyx presumably obsolete), the tepals usually connate into a cupuliform or tubular perianth, this valvately (3 or)4- or 5(-8)-lobed; stamens as many as and opposite tepals and often adnate to them at base, the filaments short, broad, the anthers 2-locular, basifixed or dorsifixed, dehiscing by longitudinal slits; disk intrastaminal, lobed, lining perianth tube or epigynous; ovary superior to inferior, 1-locular or 3-12-locular at base only, the placentation free central, the ovules 1-5 (only 1 maturing), pendulous, usually anatropous (in *Exocarpos* solitary and embedded in placental column, more or less undifferentiated), the style simple, the stigma capitate or lobed; fruit a 1-seeded drupe or nut, the pericarp often carnosous, the endocarp usually hard, the seed without a differentiated testa, the embryo straight, the endosperm copious.

DISTRIBUTION: Pantropical and subtropical, extending into temperate, often arid areas, with 30-35 genera and about 400 species. Two genera, each with a single indigenous species, are known in Fiji.

USEFUL TREATMENT OF FAMILY: PILGER, R. Santalaceae. Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 16b: 52-91. 1935.

KEY TO GENERA

Leaf blades several-nerved from base; flowers hypogynous or perigynous; stamens with short, broad, flat filaments; ovary with 1 ovule immersed in the placental column, the stigma sessile; drupe superior or semisuperior, borne on a swollen cupule nearly as thick as or thicker than fruit. . . . 1. *Exocarpos*

FIGURE 185. *Exocarpos vitiensis*; A, distal portion of branchlet, with foliage and inflorescences, $\times 1/3$; B, mature fruits, $\times 4$; C, part of inflorescence and a developing fruit, $\times 4$; D, flower at anthesis with 3 tepals removed, showing stamens (s), disk lobes (d), ovary (o), and stigmatic lobes (st), $\times 50$. A, C, & D from *Smith 1502*, B from *Gillespie 3711*.

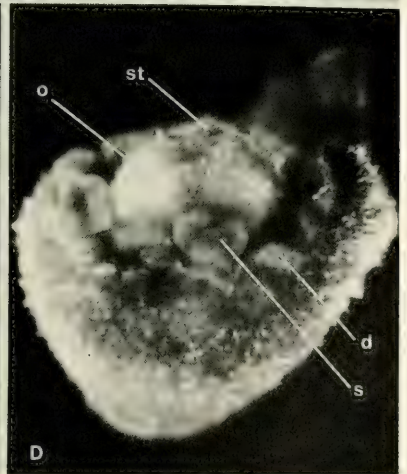




FIGURE 186. *Santalum yasi* cultivated in a village in Mathuata Province, Vanua Levu (Smith 6692).

Leaf blades pinnate-nerved; flowers at first essentially hypogynous but becoming epigynous after anthesis; stamens with ligulate filaments; ovary with 2 or 3 ovules (but only 1 maturing), the style filiform to conical or cylindrical; drupe semi-inferior or nearly inferior, with scars of perianth lobes near apex.

2. *Santalum*

1. *EXOCARPUS* Labill. Relat. Voy. Pérouse 1: 155. 1800; Stauffer in Mitt. Bot. Mus. Univ. Zürich 213: 117. 1959. Nom. cons.

Exocarpus Pers. Syn. Pl. 2: 561, orth. var. 1807; Pilger in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 16b: 67. 1935.

Trees or shrubs; leaves decussate or in 2/5 phyllotaxy, the blades several-nerved from base; inflorescences axillary, variable, paniculate or spicate, rarely 1-flowered, solitary or several in leaf axils; flowers small, ♂ or unisexual (then with stamens or ovary only slightly reduced), hypogynous or perigynous, sessile in inconspicuous depressions in rachis or rarely short-pedicellate, minutely bracteate; tepals (3 or) 4-6 (-8), erect or becoming rotate, deltoid to oblong or ovate; stamens with short, broad, flat filaments, the anthers ovoid or transversely ellipsoid, inflexed, dehiscing by introrse-lateral slits; disk carnose, slightly angular or lobed, the angles or lobes alternating with tepals; ovary semi-immersed in disk, the free portion conical, the ovule 1, immersed in the conical placental column, the stigma sessile, indistinctly lobed; drupe superior or semisuperior, subglobose to ellipsoid, terete or slightly angular, borne on a swollen, stalklike cupule, this often thicker than fruit, the exocarp membranous, the mesocarp thin-carnose, the endocarp crustaceous, the seed erect.

TYPE SPECIES: *Exocarpus cupressiformis* Labill.

DISTRIBUTION: Vietnam and Java through Malesia to Australia, Tasmania, and New Zealand eastward to Fiji, the Austral Islands, and Hawaii. In his scholarly *Revisio Anthobolearum* (1959, pp. 1-260), Stauffer interprets *Exocarpus* as comprising 26 species in three subgenera. Subgenus *Exocarpus* is divided into four sections, *E. vitiensis* being one of the four species of sect. *Sarcocalyx*, which it terminates to the east. Distribution of subgen. *Exocarpus* eastward of New Caledonia is erratic, with the Fijian species of sect. *Sarcocalyx*, the three Hawaiian species of sect. *Hawaiienses*, and the Austral Islands species, known only from Rapa, of sect. *Exocarpus*. The two remaining subgenera do not occur east of New Caledonia.

USEFUL TREATMENT OF GENUS: STAUFFER, H. U. *Exocarpus* J. J. H. de la Billardière. Mitt. Bot. Mus. Univ. Zürich 213: 117-237. 1959.

Although the spelling *Exocarpus* has frequently been used, Labillardière's original spelling was *Exocarpos*, which has been conserved (vs. *Xylophyllos* Rumph.); in the following discussion I refrain from using Persoon's spelling, regardless of authors' usages.

1. *Exocarpus vitiensis* A. C. Sm. in Sargentia 1: 29. 1942; B. Swamy in Amer. J. Bot. 36: 662. fig. 2. 1949; A. C. Sm. in J. Arnold Arb. 31: 154. 1950; Stauffer in Mitt. Bot. Mus. Univ. Zürich 213: 135. t. V. 1959; J. W. Parham, Pl. Fiji Isl. 151. 1964, ed. 2. 215. 1972. FIGURE 185.

Exocarpus latifolius sensu A. C. Sm. in Bishop Mus. Bull. 141: 49. 1936; non R. Br.

An often compact shrub or small tree 2-11 m. high, infrequent in (sometimes open) forest at elevations of 60-900 m. The flowers have greenish to white or pale yellow tepals, and the drupes are green, the cupule becoming yellow to red at maturity. Flowers and fruits have been obtained between October and April.

TYPIFICATION: The species is based on *Degener & Ordóñez 13557* (A HOLOTYPE; ISOTYPES at K, NY), collected Nov. 20, 1940, in the vicinity of Nandarivatu, Mba Province, Viti Levu.

DISTRIBUTION: Endemic to Fiji and known from three islands, although it seems rare except in northwestern Viti Levu.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Mt. Evans Range, *Greenwood* 963, *DA* 14160; Natua Levu, *DA* 14063; Vuniyasi, *DA* 2356; vicinity of Nandarivatu, *Tothill* 677, *Gillespie* 3711; slopes of Mt. Nanggarambuluta, east of Nandarivatu, *Stauffer & Koroiveibau* 5822, 5826, *DA* 12369, 13947. VANUA LEVU: MATHUATA: Southern slopes of Mt. Numbuiloa, east of Lambasa, *Smith* 6391. VANUA MBALAVU: Northern limestone section, *Smith* 1502.

Exocarpos vitiensis is related to *E. spathulatus* Schlechter & Pilger, of New Caledonia, and *E. latifolius* R. Br., of Malesia and Australia, differing in having its branchlets and young leaf blades only sparsely stellate-pilose and soon glabrate, and in having its mature drupes oblong or oblong-ovoid, comparatively large (10.5–13 mm. long), and distinctly 3–5-angled (rather than globose or ovoid, 6–9.2 mm. long, and not angled). Inflorescences of *E. vitiensis* may be 1 or 2 in leaf axils (rather than always solitary as first described), while in *E. latifolius* the inflorescences are either solitary or 2–4 (–7) together.

2. *SANTALUM* L. Sp. Pl. 349. 1753; Seem. Fl. Vit. 209. 1867; Pilger in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. **16b**: 81. 1935.

Glabrous trees or shrubs; leaves usually opposite, the blades pinnate-nerved; inflorescences variable, mostly cymose or paniculate, the bracts and bracteoles caducous; flowers ♂, 4- or 5-merous, essentially hypogynous at first but becoming epigynous after anthesis, the perianth tube campanulate, adnate to base of ovary, the lobes ovate to deltoid, spreading, basally bearing a tuft of hairs and a stamen; stamens with ligulate filaments, the anthers ovoid; disk concave, lining perianth tube, obviously lobed, the lobes alternate with tepals at summit of perianth tube; ovary nearly superior to semisuperior at anthesis, the ovules 2 or 3 (but only 1 maturing), the style filiform to conical or cylindric, the stigma inconspicuously lobed; drupe semi-inferior to nearly inferior, subglobose to ellipsoid or obovoid, with scars of perianth lobes near apex, the endocarp subligneous.

TYPE SPECIES: *Santalum album* L., the only original species.

DISTRIBUTION: India through Malesia to Australia and eastward in the Pacific to Hawaii, eastern Polynesia, and Juan Fernandez, with about 25 species, one of which is indigenous in Fiji.

1. *Santalum yasi* Seem. in *Bonplandia* 9: 258, nom. nud. 1861, Viti, 441, nom. nud. 1862, Fl. Vit. 210. *t.* 55. 1867; Drake, Ill. Fl. Ins. Mar. Pac. 283. 1892; Yuncker in Bishop Mus. Bull. **220**: 104. 1959; J. W. Parham, Pl. Fiji Isl. 152. *fig.* 57. 1964, ed. 2. 216. *fig.* 64. 1972; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 184. 1970. FIGURES 186, 187.

Tree or shrub 2–12 m. high, with a trunk to 30 cm. in diameter and usually with a spreading crown, occurring from near sea level to about 200 m. in dry or open forest, often in the *talasinga* areas, and also often cultivated in villages. The flowers have cream-colored perianth segments that turn to rich pink and purplish red; the anthers are yellow and red-tinged; the disk lobes are dark yellow; the style and stigmas are pale yellow, and the fruit turns from green to purple or reddish violet. Flowers and fruits have been found in months scattered throughout the year.

TYPIFICATION: Seemann (1867) cited his number 385 and *Sir E. Home*, both collections from Mbua Bay. Stauffer in 1963 annotated the BM sheet of *Seemann* 385 as the lectotype; this is a fitting choice, but the K sheet bears the sketches for *t.* 55 and has

FIGURE 187. *Santalum yasi*: A, distal portion of branchlet, with foliage and inflorescences, $\times 1/3$; B, mature fruits, $\times 4$; C, inflorescences, $\times 4$; D, flower at anthesis with 2 tepals, 2 stamens, and 1 disk lobe removed, $\times 12$. A & C from *DA* 1050, B from *DA* 13910, D from *Garnock-Jones* 912.



good flowers and a fruit. An appropriate citation is: *Seemann 385* (K LECTOTYPE; ISOLECTOTYPE at BM), collected in 1860 at Mbua Bay (possibly Mbua Village), Mbua Province, Vanua Levu.

DISTRIBUTION: New Hebrides (specimens at κ), Fiji, and Tonga. Sykes (1970) indicates that a single tree is known on Niue and thinks the species a probable introduction from Tonga, but it could "possibly" be indigenous. *Santalum yasi* is by no means as depleted in Fiji as once believed, occurring in fair stands in parts of western Viti Levu between the Singatoka River and the river valleys inland from Nandi, and also in parts of Mbua and Mathuata Provinces in Vanua Levu. The stand represented by *Smith 4584* was quite extensive. The species is very frequently a favorite tree of village cultivation. All specimens examined by me are cited below; many of them are from cultivated trees.

LOCAL NAMES AND USES: The *Fijian sandalwood* is most frequently known as *yasi* or *yasi ndina*, less often as *yasi mboi* or *yasiyasi*. Application of the name *yasi* or *yasiyasi* to both *Santalum* and to many myrtaceous plants was speculatively discussed by Seemann (1867). The wood is intimately associated with certain religious ceremonies and produces a fragrant incense. Extracted oil is a widely used perfume base, and the wood is furthermore valued for the making of carved objects, boxes, etc. Sandalwood was exploited in Fiji in the early years of the nineteenth century. Seemann's (1867) account of the Pacific sandalwood trade is of great interest, as are the comments on Fijian sandalwood by Horne (A Year in Fiji, 203–210. 1881).

AVAILABLE COLLECTIONS: VITI LEVU: NANDRONGA & NAVOSA: Southern slopes of Nausori Highlands, in drainage of Namosi Creek above Tumbenasolo, *Smith 4584*. TAILEVU: Mbua Island, *Wilder 1230*; Ndravo, Waindamu River, *DA 1050*. KANDAVU: Ndaku Village, *DA 2962*. VANUA LEVU: MBUA: Mbua Bay, *U. S. Expl. Exped.*; Mbua Village, *Home*, in 1852 (BM PARATYPE), *Mead 1997, 1998, 1999, 2001*; vicinity of Mbua, *DA 1119*; Nanggere, near Mbua Village, *DA 16658*; Vakandandara, Nasarowangga district, *Stauffer & Kuruvoli 5840*. MATHUATA: Serua, Ndreketi River, *Stauffer & Kuruvoli 5839, DA 13910*; Natua Village, Seanggangga Plateau, *Smith 6692, Stauffer & Kuruvoli 5851*; Nasealevu, Rumbeyanganitumbu Creek, Sasa Tikina, *DA 15252*. THAKAUNDROVE: Nakoroutari, south of Lambasa, *Berry 101*. LAKEMBA: Near Tumbou, *Garnock-Jones 911, 912*. ONEATA: In central flat forest, *Bryan 486*. FIJI without further locality, *Horne 1093*.

FAMILY 160. LORANTHACEAE

LORANTHACEAE Juss. in *Ann. Mus. Nat. Hist. (Paris)* **12**: 292, as *Loranthae*. 1808.

Shrubs, parasitic on stems and branches of trees or shrubs (or on epiphytes), rarely terrestrial shrubs or small trees hemiparasitic on roots of other plants, stipulate; leaves usually well developed (sometimes reduced to scales) and usually opposite (rarely alternate or verticillate), simple, the blades entire; inflorescences diverse, appearing racemose, spicate, umbelliform, or capitate, the basic unit usually a dichasium; flowers dichlamydeous, actinomorphic, ♂ or unisexual (then plants usually dioecious); calyx adnate to ovary, represented by a lobed or truncate limb (calyculus) at apex of ovary; petals (3 or) 4–6 (–9), valvate, free to connate into a tube, this often split on one side; stamens as many as and opposite petals, the filaments often adnate to petals, sometimes essentially lacking, the anthers 2-locular (rarely 1-locular), usually basifixed, sometimes dorsifixed and versatile, sometimes transversely locellate, dehiscent by longitudinal slits; disk present or absent; ovary inferior, usually 1 (rarely 4)-locular, with or without a free central placental column (mamelon), the ovules 4–12, without clearly defined nucellus or integument (absent as recognizable entities), the sporogenous tissue in the mamelon or in the basal tissue of ovary, the style short (or none) to elongate, the stigma small; fruit usually a 1-seeded lactiferous berry or drupe, the seeds rarely 2 or 3, without a testa, partially or completely surrounded by viscid tissue, the embryo(s) large, the endosperm copious.

DISTRIBUTION: Pantropical and subtropical, sometimes extending into temperate areas, with about 65 genera and 900 species. One genus is represented by an indigenous species in Fiji.

USEFUL TREATMENTS OF FAMILY: DANSER, B. H. The Loranthaceae Lorantheoideae of the tropical archipelagos east of the Philippines, New Guinea, and Australia. *Bull. Jard. Bot. Buitenzorg III.* **14:** 74-98. 1936. BARLOW, B. A. A revision of the Loranthaceae of New Guinea and the south-western Pacific. *Austral. J. Bot.* **22:** 531-621. 1974.

1. *Decaisnina* van Tieghem in *Bull. Soc. Bot. France* **42:** 435. 1895; Barlow in *Austral. J. Bot.* **14:** 432. 1966, in op. cit. **22:** 535. 1974, in Henty, *Handb. Fl. Papua New Guinea* **2:** 234. 1981.

Parasitic shrubs on stems and branches of other plants; leaves opposite, the blades pinnate-nerved; inflorescences axillary, racemose, the rachis bearing several decussate pairs of 3-flowered dichasia, all the flowers sessile or the 2 lateral ones short-pedicellate, each flower subtended by a single bract; petals 6 (or 7), free or shortly united at base; stamens with anthers basifixed, narrow, acute, 2-locular at maturity, transversely locellate or not, the pollen trilobate; ovary with the placental column with 3-6 basal lobes, the sporogenous cells in the lobes, the embryo sacs confined to the mamelon, the style articulate at or immediately above base; fruit baccate.

TYPE SPECIES: *Decaisnina glauca* van Tieghem.

DISTRIBUTION: Malesia and northern Australia eastward to the Society and Marquesas Islands, with about 30 species.

The single Fijian taxon of Loranthaceae has long been treated as a species of *Amylothea* van Tieghem (in *Bull. Soc. Bot. France* **41:** 261. 1894), but that genus is now considered by Barlow (supported by Kuijt, cf. *Blumea* **27:** 25. 1981) to be separable from *Decaisnina* on the basis of the degree of union of the petals (free or shortly united at base in *Decaisnina*, united to middle or higher in *Amylothea*).

Absence of the genus *Amyema* van Tieghem from Fiji is noteworthy. That genus is readily separable from *Decaisnina* (and *Amylothea*) by the form of its inflorescence (basically a many-rayed umbel of dichasia, sometimes much reduced). The species of *Amyema* that might be expected to occur in Fiji is *A. artense* (Montr.) Danser, which (Barlow, 1974, pp. 566-568) is known from New Guinea, the Caroline Islands, the Solomon Islands, New Caledonia, the New Hebrides, and Samoa. In Samoa it is frequent (cf. Christophersen in Bishop Mus. *Bull.* **128:** 79, as *Loranthus samoensis* Reinecke. 1935). In addition to inflorescence form, it is at once distinguished from *Decaisnina forsteriana* by its slender and shorter corollas with five petals. Its discovery in Fiji would not be surprising.

1. *Decaisnina forsteriana* (J. A. & J. H. Schultes) Barlow in *Austral. Nat. Univ. Publ. BG/3:* 185. 1972, in *Austral. J. Bot.* **22:** 537. 1974, in Henty, *Handb. Fl. Papua New Guinea* **2:** 235. 1981. FIGURE 95.

Loranthus stelis sensu Forst. f. *Fl. Ins. Austr. Prodr.* **25:** 1786; Seem. *Fl. Vit.* **120:** 1866; non L.

Loranthus forsterianus J. A. & J. H. Schultes, *Syst. Veg.* **7**(2): 1612, 1730. 1830; A. Gray, *Bot. U. S. Expl. Exped.* **1:** 737. 1854; Seem. in *Bonplandia* **9:** 256. 1861, Viti, 437. 1862.

Loranthus insularum A. Gray, *Bot. U. S. Expl. Exped.* **1:** 738. 1854, Atlas, *pl.* 98. 1856; Seem. in *Bonplandia* **9:** 256. 1861, Viti, 437. 1862, *Fl. Vit.* **120:** 1866, op. cit. 429. 1873; Drake, *Ill. Fl. Ins. Mar. Pac.* **282:** 1892; Gibbs in *J. Linn. Soc. Bot.* **39:** 168. 1909; Turrill in op. cit. **43:** 38. 1915; Christophersen in *Bishop Mus. Bull.* **128:** 79. 1935; J. W. Parham in *Agr. J. Dept. Agr. Fiji* **19:** 98. 1948.

Loranthus vitiensis Seem. Viti, 437, nom. nud. 1862, *Fl. Vit.* **120. t. 23.** 1866; Drake, *Ill. Fl. Ins. Mar. Pac.* **282:** 1892.

Treubella forsteriana van Tieghem in *Bull. Soc. Bot. France* **41:** 266. 1894.

Treubella vitiensis van Tieghem in *Bull. Soc. Bot. France* **41:** 267. 1894.

Treubella insularum van Tieghem in *Bull. Soc. Bot. France* **42:** 435. 1895.

- Elytranthe insularum* Engl. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. III. 1: 126. 1897.
Elytranthe vitiensis Engl. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. III. 1: 126. 1897.
Elytranthe forsteriana Engl. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. III. 1: 126. 1897.
Amylotheca forsteriana Danser in Bull. Jard. Bot. Buitenzorg III. 10: 301. 1929, in op. cit. 14: 74. 1936.
Amylotheca insularum Danser in Bull. Jard. Bot. Buitenzorg III. 10: 301. 1929, in op. cit. 14: 76. 1936;
Yuncker in Bishop Mus. Bull. 220: 105. 1959; J. W. Parham, Pl. Fiji Isl. 150, fig. 56. 1964, ed. 2. 215, fig. 63. 1972; St. John & A. C. Sm. in Pacific Sci. 25: 322. 1971; B. E. V. Parham in New Zealand Dept. Sci. Indust. Res. Inform. Ser. 85: 16, 123, 1972.
Amylotheca vitiensis Danser in Bull. Jard. Bot. Buitenzorg III. 10: 303. 1929.

Parasitic shrub to 2 m. high on the stems and branches of other plants, often locally abundant from near sea level to about 1,250 m. in dense, open, or dry forest, in crest thickets, and rarely even on the edges of mangrove swamps. The petals are bright red or crimson, often yellow proximally and violet or blackish distally, and white or yellow-green within; the stamens have filaments whitish or pale yellow to salmon-pink and anthers pale yellow; the style is yellow to pale green; and the fruits when mature turn from green to dull purple or black. Flowering and fruiting specimens may be found throughout the year.

TYPIFICATION: The typification of *Loranthus forsterianus* is unclear, although the type material doubtless came from Tahiti and from either the first or second Cook voyage. "*Forster 76* (P), under the name *Loranthus reflexus*, probably the type of the species" was listed by Danser (1936), and this specimen at P was considered the type by Barlow (1974). However, the HOLOTYPE is more likely to be a specimen at BM or M (cf. Stafleu, Tax. Lit. 397, 435. 1967; Stafleu & Cowan, Tax. Lit. ed. 2. 4: 844. 1983). The species is possibly based on G. Forster's concept of *Loranthus stelis*, which is represented at BM by a specimen and a Parkinson illustration (Seemann, 1866). The source of a Forster number "76" is to be questioned; *L. stelis* was assigned the number 157 in G. Forster's *Prodromus*.

Loranthus insularum was indicated by Gray as from Vanua Levu and Rewa (Viti Levu), Samoa (Tutuila and Savai'i), and Tonga (Tongatapu). Exploring Expedition material of the species in various herbaria is usually not assignable to particular localities. The original illustration was made from Fijian material, but the only available specimen at US is from Samoa. A suggested type citation is: *U. S. Expl. Exped.* (US 62690 HOLOTYPE), collected in 1839 in Samoa without further locality. Putative ISOTYPES (very questionably from the same plant as the holotype) are noted at GH and NY.

The type of *Loranthus vitiensis* is *Seemann 210* (K HOLOTYPE; ISOTYPES at BM, P), collected in 1860 on Mt. Mbuke Levu, Kandavu, and Mt. Voma, Namosi Province, Viti Levu. The holotype bears specimens with foliage and inflorescences, but it is not possible to tell which portions came from which locality.

DISTRIBUTION: Fiji, Tonga, the Horne Islands, Samoa, and the Cook, Society, and Marquesas Islands, with a small outlying western population on Santa Isabel, Solomon Islands. Specimens from Fiji and western Polynesia tend to have longer petals (to 55 mm. long) than those from eastern Polynesia, but this and other inflorescence characters are too variable to permit meaningful infraspecific taxa. In Fiji the species is widespread and abundant, more than 70 collections having been examined; although these came from eight islands, the sampling is doubtless inadequate. So many host plants have been recorded that their identities are not significant.

LOCAL NAMES: The Fiji mistletoe is best known as *kau ndomundomu*, and frequently as *samburo* (or variants), *lewandomundomu*, *mbuatoka*, and *mbuandataikaikau*. Locally noted names are *mokarewa* (Mba), *simbiritoko* (Serua), *vungaiali* (Thakaundrove), and *kanithamba* (Kambara).

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mt. Evans Range, *Greenwood 1259*; vicinity of Nandarivatu, *Gibbs 579*, in *Thurn 255*; Mt. Tomanivi, *DA 13034*. NANDRONGA & NAVOSA: Nausori Highlands, *DA 13398*; northern portion of Rairaimatuku Plateau, *Smith 5409*. SERUA: Hills between Wainingere and Waisee Creeks, between Ngaloa and Wainiyambia, *Smith 9374*. NAMOSI: Summit of Mt. Naitarandamu, *Gillespie 3241*; Mt. Voma, *DA 11652*; Mau, at edge of mangrove swamp, *Vaughan 3288*. NAITASIRI: Tholo-i-suva, *Stauffer & Kuruvoli 5854*. REWA: Mt. Korombamba, *Vaughan 3194*. KANDAVU: Summit of Mt. Mbuke Levu, *Smith 289*. NAIRAI: *Milne 159*. NGAU: Hills east of Herald Bay, inland from Sawaeke, *Smith 7992*. VANUA LEVU: MBUA: Southern slope of Mt. Seatara, *Smith 1679*. THAKAUNDROVE: Mt. Mbatini, *Smith 654*. TAVEUNI: *Seemann 211*. MATUKU: *Moseley*. KAMBARA: *Bryan 514*.

Danser (1936) reduced *Loranthus vitiensis* to *Amylothecha insularum* and at the same time expressed his reservations whether *A. insularum* (Fiji to Cook Islands) should be distinguished (on the basis of corolla length, proportions of peduncles and pedicels, and number of triads in the inflorescence) from *A. forsteriana* (Society Islands) and *A. mercieri* (van Tieghem) Danser (Marquesas). These three species he separated from others in *Amylothecha* because of their petals becoming entirely free at anthesis. Barlow has confirmed Danser's reservations and construes the resulting taxon, now referred to *Decaisnina*, as having the widest distribution over oceanic islands of all members of the family.

FAMILY 161. VISCACEAE

VISCACEAE Miers ex Miq. Fl. Ned. Ind. 1 (1): 803. 1856.

Monoecious or dioecious shrubs, parasitic on branches of other plants, estipulate; leaves sometimes well developed and opposite (rarely alternate or reduced to small scales or none), simple, the blades entire, with subparallel, curved nerves; inflorescences spikelike, sometimes branched, with a 3 (or 1- or 2)-flowered dischasmus in the axil of each bract, or axillary and composed of clustered flowers; flowers small, monochlamydeous, strictly unisexual, actinomorphic, perigynous or epigynous, sessile or essentially so, the tepals 2-4, valvate, often reduced to teeth or points around rim of ovary; stamens in ♂ flowers as many as and opposite tepals and adnate to them at base or free, with 1-many-locular anthers, or confluent into a synandrium, the anthers dehiscing by pores, the pollen spherical; ovary inferior, 1-locular (or sometimes solid, without a locule), containing a massive placental column (mamelon) nearly or entirely filling locule and containing the sporogenous cells, the ovules none, the embryo sac single, confined to mamelon or adjacent tissue, the style very short, the stigma small; fruit baccate, shining, sometimes explosive, the seed 1 (or 2), without a testa, surrounded by or capped at one end with viscid tissue, the embryo large, the endosperm starchy.

DISTRIBUTION: Cosmopolitan but mostly tropical and subtropical, with seven or eight genera and 350-400 species. One genus is indigenous in Fiji.

Although Miers (in *Ann. Mag. Nat. Hist.* II. 8: 179. 1851, repr. Miers, *Contrib. Bot.* 1: 39. 1862) first proposed the family name Viscaceae, I believe that Barlow (in *Proc. Linn. Soc. New South Wales* 89: 269. 1964) is correct in considering his proposal to be of a nomen provisorium in the sense of ICBN, Art. 34.1. The family Viscaceae is not listed as a conserved family name in ICBN, Appendix II.

1. KORTHALSELLA van Tieghem in *Bull. Soc. Bot. France* 43: 83. 1896; *Engl. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr.* III. 1: 138. 1897; *Engl. & Krause in op. cit. ed.* 2. 16b: 185. 1935; Danser in *Bull. Jard. Bot. Buitenzorg* III. 14: 119. 1937.

Bifaria van Tieghem in *Bull. Soc. Bot. France* 43: 164. 1896.

Heterixia van Tieghem in *Bull. Soc. Bot. France* 43: 177. 1896.

Monoecious parasitic shrubs, the stems single or branched, clearly articulated, the internodes flattened or not; leaves absent or reduced to minute, opposite scales united in pairs in collars at apices of internodes, the internodes subterete or flattened in a single plane or in alternating planes; inflorescences axillary and composed of clustered flowers (as in our species) or the flowers in terminal or axillary spikelike inflorescences with small internodes; ♂ and ♀ flowers intermingled, surrounded by moniliform hairs, ebracteolate; ♂ flowers subglobose, the perianth later deeply split into 3 deltoid tepals, the stamens connate into a globose synandrium with 6 locules dehiscing by introrse slits and emitting pollen from a single central apical pore; ♀ flowers clavate or pyriform, the perianth later as in ♂ flowers, the stigma umbonate; fruits clavate or pyriform, the tepals persistent, the seed solitary.

TYPE SPECIES: *Korthalsella remyana* van Tieghem; the type species of *Bifaria* and *Heterixia* have apparently not been designated (ING, 1979).

DISTRIBUTION: Eastern Africa, Indian Ocean islands, and southeastern Asia (from the Himalayas and Japan) through eastern Malesia, southern Australia, and New Zealand, and eastward in the Pacific to the Tuamotus and Hawaii, with about 25 species, of which two occur in Fiji.

USEFUL TREATMENTS OF GENUS: DANSER, B. H. A revision of the genus *Korthalsella*. Bull. Jard. Bot. Buitenzorg III. 14: 115-159. 1937. DANSER, B. H. A supplement to the revision of the genus *Korthalsella* (Lor.). Bull. Jard. Bot. Buitenzorg III. 16: 329-342. 1940.

Three genera described by van Tieghem in 1896 are now combined in *Korthalsella*; Engler (1897) maintained the three groups as sections, but Danser (1937) merely recognized them in his arrangement without names, pointing out that the limit between *Korthalsella* (i. e. sect. *Eukorthalsella*) and *Bifaria* is not as sharp as supposed by van Tieghem. Of the two Fijian species, *K. horneana* is said to fall into *Korthalsella* proper, with axils and branches of the plant at least in part decussate, while *K. platycaula* falls into "*Bifaria*," with axils and branches in one plane. In fact, *K. horneana* has the branches (when narrowly flattened rather than terete) usually in a single plane, and its distinction from *K. platycaula* appears primarily a matter of degree of internode flattening. Differences in flowers are not apparent.

KEY TO SPECIES

Plants comparatively slender in general shape, often 50 cm. long, the lower few internodes strictly terete and 3-5 mm. in diameter; branchlets with terete or slightly flattened internodes, in the latter case the internodes very narrow and linear-oblong, 7-25 × 1.5-3.5 mm., 4-7 times longer than broad.

1. *K. horneana*

Plants comparatively robust, forming masses up to 50 cm. in diameter, only the lowest 1 or 2 internodes terete but these sometimes 8-10 mm. in diameter; branchlets with obviously flattened internodes, these prevailing elliptic or slightly obovate to oblong, 6-30 × 3-12 mm., 2-3.5 (-6) times longer than broad.

2. *K. platycaula*

1. *Korthalsella horneana* van Tieghem in Bull. Soc. Bot. France 43: 164. 1896; Engl. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. III. 1: 138. 1897; Danser in Bull. Jard. Bot. Buitenzorg III. 14: 128. fig. 5. 1937, in op. cit. 16: 331. 1940; A. C. Sm. in J. Arnold Arb. 31: 153. 1950; J. W. Parham, Pl. Fiji Isl. 150. 1964, ed. 2. 215. 1972.

FIGURE 188.

A copiously branched parasitic shrub with branches to 50 cm. long, infrequent at elevations of perhaps 200 m. to 1,195 m. in forest and in dense thickets on ridges. Flowers and fruits have been observed at least in May and August.

TIPIFICATION: The type is *Horne 894* (P HOLOTYPE; ISOTYPES at BO, GH, K), collected in August, 1878, on the slopes of Mt. Koromba (or perhaps of eastern outliers of Mt. Koromba), Mba (or Nandronga & Navosa?) Province, Viti Levu. These data, not available to van Tieghem, are from the K duplicate, which is noted in Horne's writing

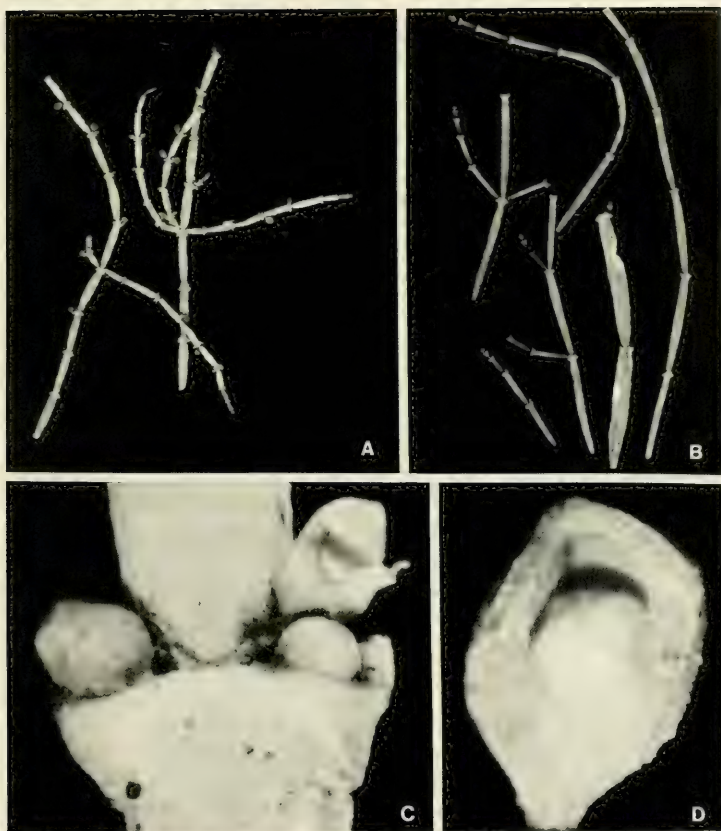


FIGURE 188. *Korthalsella horneana*; A, portions of plant with essentially terete internodes, $\times 1$; B, portions of plant with some internodes slightly flattened, $\times 1$; C, inflorescences at a node, with 1 σ flower open, $\times 30$; D, σ flower with 1 tepal removed, showing synandrium composed of confluent stamens, $\times 70$. A from *Smith 4227*, B-D from *Smith 4228*.

"...not common, on trees in the sandalwood ravine on the sides of Pickering Peak..." The locality is mentioned in *A Year in Fiji*, 42. 1881, but it is not certain that Horne was really on Mt. Koromba; he may have been in ravines on some of the eastern slopes of the Koromba Range that are actually in the Province of Nandronga & Navosa; sandalwood is still frequent in that area but has not been noted much above 200 m.

DISTRIBUTION: Endemic to Fiji and thus far known only from northern and western Viti Levu.

AVAILABLE COLLECTIONS: VITI LEVU: MBA: Summit of Mt. Koroyanitu, high point of Mt. Evans Range, *Smith 4227*, 4228; vicinity of Nandarivatu, *Greenwood 840*, *Vaughan 3407*.

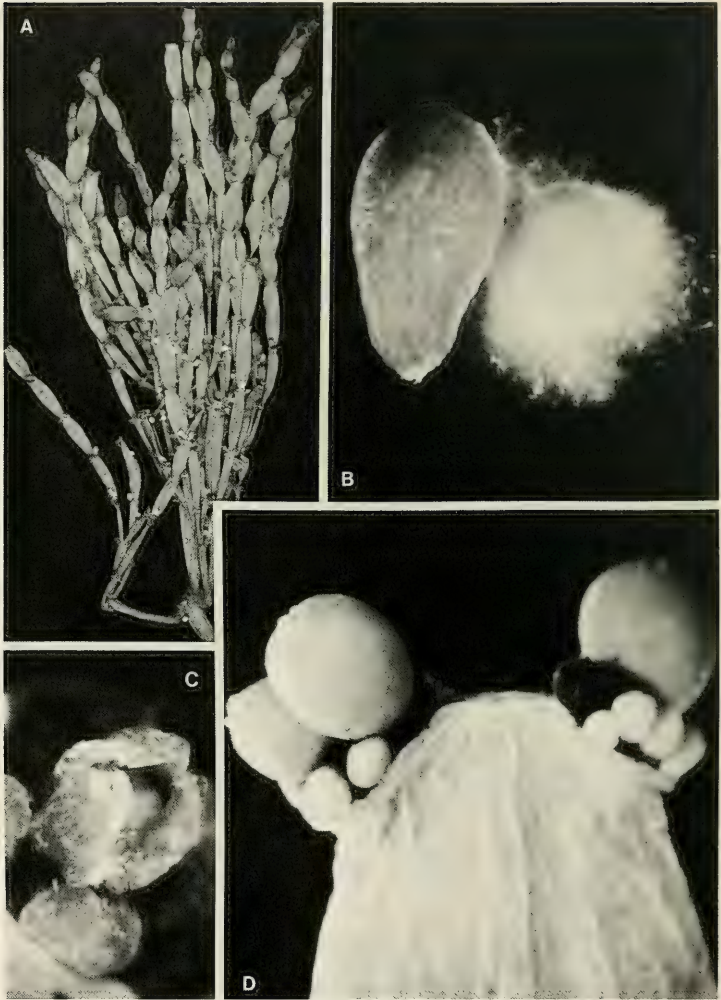


FIGURE 189. *Korthalsella platycaula*; A, portion of plant, some distal internodes with inflorescences, some proximal internodes with fruits with escaping seeds surrounded by white viscid tissue, $\times 1$; B, ♀ flower and (from another flower) removed placental column surrounded by viscid tissue, $\times 20$; C, ♂ flower at a node, showing 3 tepals and the synandrium, $\times 40$; D, inflorescences at apex of internode, $\times 15$. A from Gillespie 4563, B from Smith 7888, C from Bryan 597, D from Smith 1489.

2. *Korthalsella platycaula* (van Tieghem) Engl. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. III. 1: 138. 1897; Engl. & Krause in op. cit. ed. 2. **16b**: 186, as *K. platycaulis*. 1935; Danser in Bull. Jard. Bot. Buitenzorg III. **14**: 145. fig. 10. 1937, in op. cit. **16**: 335. 1940; Yuncker in Bishop Mus. Bull. **178**: 50. 1943; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200**: 110. 1970. **FIGURE 189.**

Viscum articulatum sensu A. Gray, Bot. U. S. Expl. Exped. 1: 744. 1854; Seem. in Bonplandia **9**: 256. 1861, Viti, 437. 1862, Fl. Vit. 120. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 282. 1892; non Burm. f.

Bifaria platycaula van Tieghem in Bull. Soc. Bot. France **43**: 170. 1896.

Bifaria vitiensis van Tieghem in Bull. Soc. France **43**: 170. 1896.

Korthalsella vitiensis Engl. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. III. 1: 138. 1897; Engl. & Krause in op. cit. ed. 2. **16b**: 186. 1935; St. John in Trans. Roy. Soc. New Zealand Bot. 1: 180. 1962.

Korthalsella platycaula var. *vitiensis* Danser in Bull. Jard. Bot. Buitenzorg III. **16**: 337. 1940; J. W. Parham, Pl. Fiji Isl. 150. 1964, ed. 2. 215. 1972.

As seen in Fiji, *Korthalsella platycaula* is a parasitic shrub growing in masses up to 50 cm. in diameter, occurring from near sea level to an elevation of about 500 m. in often dense forest (on various hosts). The flowers and fruits are yellowish green and have been obtained between February and September.

TIPIFICATION: *Bifaria platycaula* is based on *Moerenhout s. n.*, collected on Tahiti in 1834 (P HOLOTYPE; ISOTYPE at G) and given the manuscript name *Viscum platycaulon* by Bertero. The type of *Bifaria vitiensis* is *U. S. Expl. Exped.* (P HOLOTYPE; putative ISOTYPE at US 78373), obtained in Fiji in 1840 and identified by Gray as *Viscum articulatum*. Exploring Expedition specimens came from Ovalau and Vanua Levu, but the specimens cannot now be tied to localities.

DISTRIBUTION: Fiji to the Tuamotu Islands (as far as Henderson Island) and Hawaii. In Fiji the species is probably more abundant than the few available collections signify; it is often seen on *Inocarpus fagifer* but is by no means selective of a host plant.

LOCAL NAME: An occasionally used name is *kambikambi*, an allusion to the fact that the parasite sticks to other plants.

AVAILABLE COLLECTIONS: OVALAU: Vicinity of Levuka, *Gillespie 4563*. NGAU: Slopes of Mt. Ndelaitho, on northern spur toward Navukailangi, *Smith 7888*. TAVEUNI: *Seemann 212*. VANUA MBALAVU: *Bryan 579*; northern limestone section, *Smith 1489*. FIJI without further locality, *Harvey*, Nov., 1855, *Horne 528*.

Danser in 1937 accepted *Korthalsella platycaula* as a widely distributed species occurring in Fiji, the Society, Marquesas, and Austral Islands, and Hawaii. In 1940 he modified this opinion to treat the typical (unnamed) variety as occurring in the Cook, Society, Marquesas, Tuamotu, and Hawaiian Islands. At that time he added two varieties, var. *vitiensis* noted as from Fiji and the Tubuai and Tuamotu Islands (including Henderson), and var. *rapensis* (F. Br.) Danser from Rapa. Variety *vitiensis* has been accepted by many authors at least in herbarium identifications, and was reinstated at the specific level (following Engler) by St. John (1962). However, neither pronounced and stable morphological characters nor geographic groupings seem to dictate the use of infraspecific categories in *K. platycaula*.

ORDER BALANOPHORALES

FAMILY 162. BALANOPHORACEAE

BALANOPHORACEAE L. C. & A. Rich. in Mém. Mus. Hist. Nat. **8**: 429, as *Balano-phoreae*. 1822.

Monocious or dioecious herbs, destitute of chlorophyll and roots, parasitic on roots of trees and shrubs (or rarely herbs), with colors ranging from yellowish white to red or brown; stems with or without leaves, unbranched, arising from tubers at point of contact with host root, the leaves if present scaly, spirally arranged or opposite or whorled; inflorescences once-branched or spadixlike with suppressed branches, the branches if present subtended by bracts; flowers unisexual; ♂ flowers 2-6-merous, with or without a perianth, pedicellate or sessile, subtended by bracts or not, the perianth if present of free 1-seriate tepals; stamens 1 or 2 and free opposite tepals or 3-6 united into a synandrium; ♀ flowers not subtended by bracts, with or without a perianth, this if present 2-lobed or irregularly lobed; ovary inferior, lacking a definite placenta and ovules, usually with a single embryo embedded in its central tissues, the styles 1 or 2, the stigma subcapitate; fruit small, indehiscent, nutlike, 1-seeded, the embryo surrounded by endosperm and a layer of stone cells.

DISTRIBUTION: Pantropical and subtropical, with 18 genera and about 45 species; one genus occurs indigenously in Fiji.

USEFUL TREATMENTS OF FAMILY: HANSEN, B. *Balanophoraceae*. Fl. Males. I. 7: 783-805. 1976. HANSEN, B. *The Balanophoraceae of the Pacific*. Acta Phytotax. Geobot. 33: 92-102. 1982.

1. *Balanophora* J. R. & G. Forst. Char. Gen. Pl. 50. 1775, ed. 2. 99. 1776; Seem. Fl. Vit. 99. 1866; Harms in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 16b: 329. 1935; B. Hansen in Dansk Bot. Arkiv 28 (1): 84. 1972, in Fl. Males. I. 7: 791. 1976, in Acta Phytotax. Geobot. 33: 98. 1982.

Herbaceous parasites, usually dioecious, less frequently monocious (as in our taxon), the tubers forming a mass to 25 cm. in diameter branching from base, each tuber ovoid to globose, 1-6 cm. in diameter; leaves 2-40, whorled, opposite, distichous or spirally arranged; inflorescence terminating stem, spadixlike, not branched, the flowers pedicellate or not; ♂ inflorescences racemose or spicate, the flowers usually subtended by short, truncate bracts; ♀ inflorescences spicate, ovoid to subglobose, the bracts transformed into subclavate spadices, these surrounded by and sometimes proximally bearing flowers; inflorescences in monocious plants with ♂ and ♀ flowers intermixed or with ♂ flowers below and/or above ♀ flowers; ♂ flowers actinomorphic or zygomorphic, the perianth with 3-6 (-14) tepals, these ovate to lanceolate, acute to truncate, the stamens forming a somewhat elongated synandrium, the anthers 4 or 5 (or number indeterminable), opposite tepals when few in number, the locules dehiscent longitudinally, sometimes transversely locellate; ♀ flowers very small, lacking a perianth, the ovary ellipsoid, the style filiform, apparently stigmatiferous at and near apex.

TYPE SPECIES: *Balanophora fungosa* J. R. & G. Forst.

DISTRIBUTION: Tropical Africa, Indian Ocean islands, and subtropical to tropical Asia through Malesia to tropical Australia and eastward in the Pacific to the Society and Marquesas Islands, with about 15 species (Hansen, 1972). A single species is known from Fiji.

USEFUL TREATMENT OF GENUS: HANSEN, B. *The genus Balanophora* J. R. & G. Forster. A taxonomic monograph. Dansk Bot. Arkiv 28 (1): 1-188. 1972.

1. *Balanophora fungosa* J. R. & G. Forst. Char. Gen. Pl. 50. pl. 50. 1775, ed. 2. 100. pl. 50. 1776; B. Hansen in Dansk Bot. Arkiv 28 (1): 93. 1972, in Fl. Males. I. 7: 794. 1976, in Acta Phytotax. Geobot. 33: 100. 1982.

DISTRIBUTION: Southeastern Asia (from Ceylon, India, Yunnan, and Ryukyu Islands) through Malesia to the Mariana Islands and Queensland and eastward to Fiji. Hansen divides *Balanophora fungosa* into two subspecies, subsp. *fungosa* (monoe-



FIGURE 190. *Balanophora fungosa* subsp. *fungosa* from the forest floor of a mountain slope on Ovalau (Smith 8068), \times about 5/6.

cious) and subsp. *indica* (Arn.) B. Hansen (dioecious). In general, subsp. *fungosa* occupies the eastern portion of the range of the species (cf. Hansen's maps: 1972, fig. 9; 1976, fig. 9; 1982, fig. 2).

1a. *Balanophora fungosa* subsp. *fungosa*; B. Hansen in Dansk Bot. Arkiv 28 (1): 98. fig. 19; pl. 1, A, B, 5, A-C. 1972, in Fl. Males. I. 7: 794. fig. 8, a-c. 1976, in Acta Phytotax. Geobot. 33: 101. fig. 5, A. 1982. FIGURE 190.

Balanophora fungosa sensu J. R. & G. Forst. loc. cit; Forst. f. Fl. Ins. Austr. Prodr. 64. 1786; Seem. Viti, 437. 1862, Fl. Vit. 99. 1866; Drake, Ill. Fl. Ins. Mar. Pac. 284. 1892; Harms in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 16b: 331. fig. 166, A. 1935; A. C. Sm. in Sargentia 1: 30. 1942, in J. Arnold Arb. 31: 155. 1950, in Smithsonian Rep. 1954: opp. 310. pl. 10, fig. 2. 1955; J. W. Parham, Pl. Fiji Isl. 153. 1964, ed. 2. 218. 1972.

Balanophora sp. Milne in Hook. J. Bot. Kew Gard. Misc. 7: 152. 1855.

As seen in Fiji, this infrequently collected parasite is known from near sea level to an elevation of about 900 m. in dense or dry forest. The leaves (2-3 cm. long) and inflorescences vary from white to dull yellowish pink. The ellipsoid inflorescences bear numerous, small ♀ flowers in the upper part, with larger ♂ flowers in a zone 5-10 mm. high below the ♀ part. Flowers have been obtained between May and July, but Hansen (1982) notes the flowering of Pacific specimens until September.

TYPEFICTION: The type is *J. R. & G. Forster* (BM LECTOTYPE indicated by Hansen, 1972, p. 94; ISOLECTOTYPES at c, s, UPS), collected in August, 1774, on Tanna, New Hebrides, during the second Cook voyage. Actually the BM specimen is clearly indicated as "*W. Anderson*," and one of the specimens at s as "*Sparman*," as noted by Hansen (1972, p. 12). Therefore it is uncertain which of the collectors on the second Cook voyage actually obtained the type specimens, or indeed whether they all came from a single colony.

DISTRIBUTION: Southeastern Asia (Burma and Ryukyu Islands only) and Malesia, the Mariana Islands, and Queensland eastward in the Solomons, New Caledonia, New Hebrides, and Fiji.

LOCAL NAMES: Names each recorded once only are *varavara* (Waya), usually used for certain terrestrial orchids, and *tumbutumbu* (Ra). It is believed by Fijians in Ra (*Degener 15418*) that presence of the plant stimulates the growth of yams.

AVAILABLE COLLECTIONS: YASAWAS: WAYA: Olo Creek, north of Yalombi, *St. John 18029*. VITILEVU: MBA: Northern slopes of Mt. Namendre, east of Mt. Koromba, *Smith 4525*. RA: Vatundamu, vicinity of Rewasa, near Vaileka, *Degener 15418*. OVALAU: Slopes of Mt. Koronimoko, vicinity of Thawathi, *Smith 8068*. VANUA LEVU: MATHUATA: Mountains near Lambasa, *Greenwood 612*. MATUKU: *Bryan*, July 5, 1924. LAKEMBA: Between Wathiwathi and Tumbou Jetty, *Garnock-Jones 938*. Additionally, Milne (1855, cited above) in a letter stated that he had collected *Balanophora* on Moala in 1854, but no specimen was located at κ. This was the first indication by a botanist that the genus occurs in Fiji; Seemann (1866) also remarked that the specimen "does not seem to have reached the Kew Museum."

ORDER PROTEALES

The unifamilial order Proteales has presented many problems as to origin and affinities (Johnson & Briggs, 1975, pp. 89-94) but is perhaps best considered an early divergence from a primitive angiosperm stock with a degree of affinity with the Rosales (*sensu lat.*). Close association of the Proteales with any other extant order is highly improbable.

FAMILY 163. PROTEACEAE

PROTEACEAE Juss. Gen. Pl. 78, as *Proteae*. 1789.

Shrubs or trees, glabrous or with indument of 3-celled, uniseriate trichomes, stipulate; leaves alternate, infrequently opposite or whorled, simple to pinnatifid or pinnately or bipinnately compound, the blades usually coriaceous, entire or dentate; inflorescences axillary, terminal, or borne on branches or trunks, racemose or paniculate or much condensed or reduced, sometimes capitate, bracteate (bracts small and caducous or sometimes accrescent), the unit inflorescence often reduced to a peduncle (often lost) bearing 2 flowers; flowers usually ♂, less often unisexual (plants then monoecious or dioecious), actinomorphic or zygomorphic, 4-merous, hypogynous, protandrous, commonly arranged in pairs, monochlamydeous, the torus flat or oblique; tepals commonly petaloid, valvate, distinct or proximally united, broadened apically into a limb; stamens 4, antetepalous, the filaments broad, adnate to tepals to varying lengths, the anthers erect, basifixed, 2-locular, introrse, dehiscing lengthwise, sometimes reduced or staminodial, the connective often distally prolonged; hypogynous glands usually present, often nectariferous, borne within the androecial whorl, sometimes forming an annular disk, often 4 (or 3 or 2) and distinct or variously connate; ovary superior, 1-locular, sessile or stipitate, the ovules solitary or paired, orthotropous and pendulous or anatropous and ascending from base or laterally, or ovules numerous and biseriolate, the style terminal, elongate, thickened distally, the stigma terminal or lateral; fruit a follicle, tardily dehiscent or indehiscent, with or

without dorsal or lateral wings, with or without a coma of hairs or awns, with or without dissepiments, often 1-seeded or seeds paired or biseriate (or few), the seeds sometimes winged, the embryo straight, the endosperm usually lacking.

DISTRIBUTION: Tropical and subtropical, especially in the Southern Hemisphere, with about 76 genera and 1,000–1,300 species. One genus has indigenous species in Fiji and two others have been cultivated there.

USEFUL TREATMENTS OF FAMILY: SLEUMER, H. *Proteaceae*. Fl. Males. I. 5: 147–206. 1955. JOHNSON, L. A. S., & B. G. BRIGGS. Evolution in the Proteaceae. Austral. J. Bot. 11: 21–61. 1963. HUTCHINSON, J. *Proteaceae*. Gen. Fl. Pl. 2: 272–293. 1967. JOHNSON, L. A. S., & B. G. BRIGGS. On the Proteaceae—the evolution and classification of a southern family. Bot. J. Linn. Soc. 70: 83–182. 1975. In their important paper of 1975, Johnson and Briggs introduce new concepts and provide a new starting point for an understanding of the family, rendering somewhat obsolete most earlier considerations of it.

KEY TO GENERA

- Ovules lateral, hemitropous; inflorescences lacking peduncles and floral bracts, the flowers pedicellate in pairs or solitary, zygomorphic, diagonally oriented; anthers without free filaments; disk annular or somewhat bilobed; fruit dehiscent along adaxial margin or into 2 nearly free valves, the seeds compressed, usually membranously circumalate; leaves of our species deeply pinnatifid or pinnate; cultivated only. 1. *Grevillea*
- Ovules pendulous, orthotropous; fruit indehiscent (or very tardily dehiscent), the seeds large, unwinged. Pre-adult leaves simple; adult leaves verticillate or subopposite, simple; inflorescences lacking peduncles and floral bracts, the flowers pedicellate in pairs (or small clusters) or solitary, actinomorphic or slightly zygomorphic, the torus transverse; free filaments obvious; disk actinomorphic, the glands 4, distinct or united and cupuliform around ovary; cultivated only. 2. *Macadamia*
- Pre-adult leaves pinnate; adult leaves alternate, simple or imparipinnate; flowers paired, dorsally opposed and sessile at apex of a peduncle, zygomorphic, with anteroposterior orientation, the torus oblique; free filaments none or minute; disk ventrally unilateral, composed of 2 mostly fused glands; indigenous. 3. *Turillia*

1. *GREVILLEA* R. Br. ex Salisb. in Knight, Cult. Pl. Prot. 120, as *Grevillia*. 1809; corr. R. Br. in Trans. Linn. Soc. 10: 167. 1810; Sleumer in Fl. Males. I. 5: 154. 1955; Hutchinson, Gen. Fl. Pl. 2: 282. 1967; C. Towns. in Rev. Handb. Fl. Ceylon 2: 485. 1981. Nom. et orth. cons.

Trees or shrubs; leaves spirally arranged, simple or pinnate; inflorescences composed of racemes, these solitary or in a terminal or axillary panicle, without floral bracts, the peduncles none; flowers ♂; pedicellate in pairs or solitary, zygomorphic, diagonally oriented; perianth tube mostly recurved, sometimes straight, the limb subglobose, usually oblique, with segments cohering after perianth tube has split; anthers ovate or oblong, sessile in cavities of limbs, the connective not or scarcely produced beyond anthers; disk annular, sometimes somewhat bilobed; ovary stipitate or subsessile, the ovules 2, collateral, hemitropous, laterally attached at about middle of locule, the style filiform, usually protruding through slit on lower side of perianth tube before separation of tepals, the apex oblique or lateral, the stigma small; fruit follicular, usually oblique, coriaceous to subligneous, dehiscent along adaxial margin or into 2 nearly free valves, the seeds 1 or 2, compressed, usually membranously circumalate.

TYPE SPECIES: *Grevillea aspleniifolia* R. Br. ex Salisb., typ. cons.

DISTRIBUTION: Mostly in Australia but also in Malesia and New Caledonia, probably with more than 250 species. One species is cultivated in Fiji.

1. *Grevillea banksii* R. Br. in Trans. Linn. Soc. 10: 176. 1810; J. W. Parham, Pl. Fiji Isl. ed. 2. 153. 1972.

Grevillea robusta sensu B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 115. 1939; J. W. Parham, Pl. Fiji Isl. 107. 1964; non Cunn.

Shrub or slender tree to 8 m. high, cultivated (or perhaps locally naturalized) from near sea level to about 200 m.; branches and inflorescences soft-ferruginous-

tomentellous; leaves to 25 cm. long, deeply divided, the blades ferruginous-sericeous beneath; racemes to 10 cm. long; perianth yellowish to nearly white, sometimes green- or red-tinged, 13–20 mm. long; fruits obliquely ovoid, compressed, 1.5–2.5 cm. long, the seeds narrowly winged.

TYPIFICATION: Brown recorded the species from Keppel Bay, Pine Port, etc., Queensland, Australia; no specimen was cited.

DISTRIBUTION: Queensland, often cultivated elsewhere.

LOCAL NAME AND USES: Recorded in Fiji as *silky oak*, the species is considered an ornamental and shade tree, and it is said to have useful wood.

AVAILABLE COLLECTIONS: VITI LEVU: NAITASIRI: Principal Agricultural Station, Koronivia, DA 12350. REWA: Vunikawai, DA 6055.

Cultivated specimens of only one species of *Grevillea* (*G. banksii*) have been seen from Fiji. The plant mentioned by J. B. Thurston in his 1886 *Catalogue* as *G. robusta* is presumably correctly referred to *G. banksii*, as noted by J. W. Parham (1972); the occurrence of *G. robusta* in Fiji remains to be documented. *Grevillea banksii* may be distinguished from *G. robusta* by having its leaves deeply pinnatifid or pinnate and with linear-lanceolate, undivided segments; its inflorescence parts are copiously tomentellous, the indument being subsistent in fruit. *Grevillea robusta*, in contrast, has its fully developed leaves deeply bipinnatifid, the segments with pronounced lobes; its inflorescence parts and fruits are essentially glabrous. The latter species has been recorded as cultivated on Niue (Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 172. 1970).

2. *MACADAMIA* F. v. Muell. in Trans. & Proc. Philos. Inst. Victoria 2: 72. 1858; Sleumer in Blumea 8: 3. 1955, in Fl. Males. I. 5: 194. 1955; Hutchinson, Gen. Fl. Pl. 2: 281. 1967.

Trees or large shrubs, the pre-adult leaves simple; adult leaves verticillate or subopposite, the blades entire or spinose-serrate; inflorescences terminal or axillary, simply racemose, without floral bracts, the peduncles none; flowers ♂, pedicellate in pairs (or small clusters) or solitary, with pedicels partly connate or free, actinomorphic or slightly zygomorphic, the torus transverse; perianth tube slightly curved, slender, laterally split by style, finally completely split into 4 linear, recurved tepals; stamens with filaments inserted about middle of tepals or higher, the free parts of filaments long, the anthers oblong, the connective produced into a gland or short appendage; disk actinomorphic, the glands broad, truncate, distinct or united and cupuliform around ovary; ovary sessile, the ovules 2, orthotropous, pendulous from near apex of locule, the style long, straight, clavate, the stigma small, terminal; fruit subglobose, indehiscent or tardily dehiscent, the exocarp fleshy, the endocarp hard, coriaceous, the seeds 1 or 2, if solitary subglobose, if 2 hemispherical, unwinged, the testa membranous or hard, the cotyledons thick, fleshy.

TYPE SPECIES: *Macadamia ternifolia* F. v. Muell.

DISTRIBUTION: Eastern Australia, Malesia (Celebes), and New Caledonia, with about nine species, one of which is cultivated in Fiji.

1. *Macadamia tetraphylla* L. Johnson in Proc. Linn. Soc. New South Wales 79: 15. 1954; J. W. Parham, Pl. Fiji Isl. 107. 1964, ed. 2. 153. 1972.

Macadamia ternifolia sensu B. E. V. Parham in Agr. J. Dept. Agr. Fiji 10: 115. 1939; Yuncker in Bishop Mus. Bull. 178: 50. 1943; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. 200: 172. 1970; non F. v. Muell.

Large shrub or medium-sized tree, sometimes several-stemmed at base; racemes to 30 cm. long; perianth pale lilac to cream-colored, about 8 mm. long, densely appressed-pilose; disk glands connate and cupuliform; fruit globose, 2–3 cm. in diameter, slightly rugose.

TYPIFICATION: The type is *T. G. Hewitt* (NSW 25513 HOLOTYPE), collected in September, 1909, at Lismore, New South Wales, Australia.

DISTRIBUTION: Australia, in northern New South Wales and Queensland, but now widely cultivated elsewhere. In the Pacific it is grown in Hawaii and has also been noted on Niue, where it was recorded as *Macadamia ternifolia* by Yuncker and Sykes but indicated by the latter as more likely referable to *M. tetraphylla*, the correct identification (*Yuncker 10142*, BISH).

LOCAL NAME AND USE: The *Queensland nut* is one of the commercially valuable species of *macadamia*; its cultivation in Fiji has been encouraged but perhaps it is not yet grown on a large scale.

Although no herbarium vouchers document the species of *Macadamia* introduced into Fiji in the 1880's, it is presumably *M. tetraphylla* (J. W. Parham, 1964, 1972). It was first listed from Fiji as *M. ternifolia* by J. B. Thurston in his 1886 *Catalogue*. Distinctions between the two species are discussed by Johnson (1954). *Macadamia tetraphylla* has its leaves mostly in whorls of four, the petioles 2 mm. long or less, and the blades with 13–20 pairs of main secondary nerves and always spinose-dentate with about 35–40 teeth per side; the leaves of *M. ternifolia* are mostly in whorls of three, with petioles 4–15 mm. long and blades with 7–12 pairs of main secondary nerves and in later stages entire.

3. TURRILLIA A. C. Sm., gen. nov.¹

Kermadecia sensu A. C. Sm. in J. Arnold Arb. 36: 277. 1955; et auct.; non Brongn. & Gris.

Bleasdalea (F. v. Muell. Fragm. Phyt. Austral. 5: 91, nom. provis. 1865; F. v. Muell. ex Domin in Biblioth.

Bot. 22 (Heft 89): 32 (586), nom. invalid. 1921) sensu A. C. Sm. & J. Haas in Amer. J. Bot. 62: 138. 1975.

Trees, the young parts and inflorescences glabrous to puberulent or tomentose; leaves alternate, simple or imparipinnate at maturity (pre-adult leaves pinnate), the rachis of pinnate leaves sometimes winged, the blades serrate or dentate to entire; inflorescences axillary or borne on branches below leaves, the rachis terete, slender, sometimes with 1–few lateral branches, each unit inflorescence with a common peduncle subtended by a minute, ovate bract; flowers ♂, paired, dorsally opposed and sessile at apex of peduncle, ebracteolate, zygomorphic, with anteroposterior orientation, the torus oblique; perianth ventrally saccate at base in bud, the tepals 4, cohesive in bud, ligulate, apically broadened into an ovate, introrsely apiculate limb, glabrous within, the posterior tepal suberect after anthesis; stamens essentially sessile on limbs of tepals (free filaments very short or none), the anthers ovoid to oblong, mucronulate at apex,

¹Genus *Sleumerodendro* Virost, *Euplassae* Salisb. ex Knight, et praesertim *Gevuinae* Molina affinis; a *Sleumerodendro* et *Euplassa* disco glandulis non nisi 2 composito etiam characteribus fructus conspicuis differt; a *Gevuina* disci glandulis pro parte maxima coalitis (in illa separatis), ovario glabro vel tantum pilis dispersis induto (in illa conspicue strigoso), stylo interdum rectiusculo (non semper valde recurvo), stigmatibus laterali et ventraliter obliquo vel interdum terminali et paulo inaequilaterali (non conspicue inaequilaterali) differt; etiam fructu maturo inaequilateraliter obovoideo et lateraliter complanato (non ut in *Gevuina* subglobo et in sectione transversali circulari), quidem 20 mm. longo et lato (in illa minus quam vel vix 20 mm. diametro), apice rostrato et styli basi persistenti (in illa styli basi evanida), et endocarpio osseo et comparate (1.5–4 (–5) mm.) crasso (in illa comparate tenui 0.5–1.7 mm. crasso) distinguitur; necnon foliis juvenilibus imparipinnatis et foliorum adultorum si pinnatorum rhachidi interdum alata (in illa foliis juvenilibus bipinnatis et rhachidi non alata) distinctum.

with slightly protruding connectives; disk composed of 2 mostly fused glands, ventrally unilateral; ovary with a carnose, cylindrical stipe, the ovules 2, collateral, pendulous, subapical, orthotropous, with a loose outer integument sometimes shorter than the inner integument, the ovary glabrous or scattered-pilose, gradually narrowed into the style, the style cylindrical, recurved to straight, distally clavate and inaequilateral and there in bud with copious, dark red, glandular hairs, these caducous at maturity, the stigma lateral and ventrally oblique to terminal and slightly inaequilateral; fruit inaequilaterally obovoid, laterally somewhat flattened, obtuse at base and cicatricose with a circular scar (from attachment to peduncle) 2-3 mm. in diameter, apically rostrate with the persistent style base, subacutely angled on ventral ridge, rounded on dorsal ridge, the exocarp thin, not well differentiated from the coriaceous mesocarp, the endocarp bony, thick, the seed solitary, the testa crustaceous, the cotyledons fleshy, filling fruit cavity.

TYPE SPECIES: *Turrillia vitiensis* (Turrill) A. C. Sm. (*Kermadecia vitiensis* Turrill), here designated.

DISTRIBUTION: Fiji (two species), New Hebrides¹, New Guinea², and Queensland, Australia³, with five species.

USEFUL TREATMENTS OF GENUS: SMITH, A. C., & J. E. HAAS. Studies of Pacific Island plants. XXIX. *Bleasdalea* and related genera of Proteaceae. Amer. J. Bot. 62: 133-147. 1975. HAAS, J. E. The pollen of *Bleasdalea* and related genera of Proteaceae. Pollen & Spores 17: 213-222. 1975.

The genus is named in honor of William Bertram Turrill (1890-1961), eminent British botanist and former Keeper of the Herbarium and Library of the Royal Botanic Garden, Kew. During his long period of service to Kew (1909-1957), Turrill was friend and adviser to innumerable visiting botanists. His study of im Thurn's Fijian collections (cf. J. Linn. Soc. Bot. 43: 15-39. 1915) first disclosed the occurrence of the family Proteaceae in Fiji, even though Seemann had made an earlier collection (of a different species of *Turrillia*) which, being sterile, had not been recognized as representing the family.

In the system proposed by Johnson and Briggs (1975), subtrib. Gevuinae (of subfam. Grevilleoideae, trib. Macadamieae) includes three genera, *Gevuina* Molina, *Sleumerodendron* Virot, and *Euplassa* Salisb. ex Knight. Smith and Haas (1975) utilized this grouping but separated a cluster of five paleotropical species (as *Bleasdalea*) from *Gevuina*, interpreting the latter as restricted to South America. A new genus, *Turrillia*, is here proposed for these five Old World species, to replace the prior concept of *Bleasdalea*, which must now be considered an invalid generic name.

Smith and Haas (1975, pp. 134, 140) considered *Bleasdalea* (F. v. Muell. ex Domin in Biblioth. Bot. 22 (Heft 89): 32 (586). 1921) validly published. The Seattle edition (1972) of ICBN was then in effect, and it was believed that a reasonable interpretation of Arts. 32 (3) and 42 (1) permitted the use of Domin's generic name. Such use would

¹*Turrillia lutea* (Guillaumin) A. C. Sm., comb. nov.

Kermadecia lutea Guillaumin in J. Arnold Arb. 13: 86. 1932.

Bleasdalea lutea A. C. Sm. & J. Haas in Amer. J. Bot. 62: 147. 1975, q. v. for further details.

²*Turrillia papuana* (Diels) A. C. Sm., comb. nov.

Euplassa papuana Diels in Bot. Jahrb. 54: 200. 1916.

Gevuina papuana Sleumer in Blumea 8: 6. 1955.

Bleasdalea papuana Domin in Biblioth. Bot. 22 (Heft 89): 32 (586). 1921; A. C. Sm. & J. Haas in Amer. J.

Bot. 62: 141. 1975, q. v. for further details.

³*Turrillia bleasdalei* (F. v. Muell.) A. C. Sm., comb. nov.

Gevuina bleasdalei F. v. Muell. Fragm. Phyt. Austral. 5: 90. 1865.

Gevuina bleasdalei Sleumer in Blumea 8: 6. 1955.

Bleasdalea bleasdalei A. C. Sm. & J. Haas in Amer. J. Bot. 62: 142. 1975, q. v. for further details.

apparently also have been permitted by the Leningrad (1978) edition (Arts. 32.1 (c) and 42.1 (a)). However, in the Sydney edition (1983) the following sentence was added to Art. 42.1: "Reference to an earlier description or diagnosis is not accepted as provision of such a description or diagnosis." This sentence definitely invalidates Domin's generic name *Bleasdalea*, since he did not provide a formal description but referred to an earlier nomen provisiorium (F. v. Muell. Fragm. Phyt. Austral. 5: 91. 1865) which was construed as a descriptio generico-specifica. (*Bleasdalea* was not listed by ING (1979), suggesting that its editors were not convinced by the treatment of Smith and Haas, whose conclusion at any rate has been unacceptable since 1983.)

The designation of *Turrillia vitiensis* as the type species of the new genus will permit future students of Proteaceae the following alternatives. (1) *Turrillia* can be interpreted, as here proposed, as composed of five paleotropical species allied to but reasonably distinct from the South American *Gevuina*. (2) *Turrillia* can be accepted for the three Melanesian species (of Fiji and the New Hebrides), while the species of New Guinea and Australia are construed as true representatives of *Gevuina*. (3) All five paleotropical species of this alliance can be referred to *Gevuina*. This is the solution hinted at by Johnson and Briggs in 1963 (p. 49) and adopted by them in 1975 (pp. 100, 165), although they did not propose nomenclatural combinations in *Gevuina* for the three Melanesian species.

KEY TO SPECIES

- Young parts and inflorescences minutely ferruginous-puberulent with hairs about 0.1 mm. long, soon glabrate; adult leaves (very rarely simple) usually compound, up to 25 × 17 cm., with (3-) 5-9 leaflets (if simple with leaf blades similar to that of terminal leaflets), the leaflet blades ovate to (terminal one) broadly elliptic, (2.5-) 4-12 × (1-) 3-8 cm.; primary inflorescences simply racemose or paniculate with 1-9 lateral branches, 8-26 cm. long, the peduncles of unit inflorescences 5-11 mm. long; flowers straight and 12-18 mm. long at anthesis, the tepals 1-1.5 mm. broad at base; anthers oblong, 1.5-2 mm. long and 0.5-0.8 mm. broad; disk (of 2 fused glands) about 1.6 mm. high and 2 mm. broad; style straight, distally clavate and slightly inaequilateral, the stigma terminal and slightly inaequilateral; mature fruits 18-36 × 14-31 mm., the mesocarp about 1 mm. thick, the endocarp 2-3.5 mm. thick. 1. *T. vitiensis*
- Young parts and inflorescences densely ferruginous-tomentose with hairs 0.2-0.4 mm. long, at length subglabrate; adult leaves always simple (juvenile ones compound, up to 75 × 43 cm.), the blades ovate, 7-20 (-25) × 4.5-15 (-17) cm.; primary inflorescences simply racemose (rarely with 1 or 2 lateral branches), 7.5-25 cm. long, the peduncles of unit inflorescences 2.5-3 mm. long; flowers ventrally recurved (except dorsal tepal), about 11 mm. long at anthesis, the tepals about 1 mm. broad at base; anthers narrowly ovoid, about 1.2 mm. long and 0.7 mm. broad; disk (of 2 fused glands) about 0.5 mm. high and broad; style recurved, the stigma broadly ovate, lateral, ventrally oblique; mature fruits 30-40 × 20-30 mm., the mesocarp 1-2 mm. thick, the endocarp 2-4 (-5) mm. thick. 2. *T. ferruginea*

1. *Turrillia vitiensis* (Turrill) A. C. Sm., comb. nov. FIGURES 191, 192A.

Kermadecia vitiensis Turrill in Hook. Icon. Pl. 31: t. 3022. 1915, in J. Linn. Soc. Bot. 43: 36. 1915; Gillespie in Bishop Mus. Bull. 91: 4, fig. 2. 1932; A. C. Sm. in op. cit. 141: 47. 1936, in J. Arnold Arb. 36: 277. 1955; J. W. Parham, Pl. Fiji Isl. 107, fig. 46, C. 1964, ed. 2. 153, fig. 46, C. 1972.
Bleasdalea vitiensis A. C. Sm. & J. Haas in Amer. J. Bot. 62: 144, fig. 40-46. 1975.

An often slender tree 4-28 m. high, with a trunk to 65 cm. (or more?) in diameter (sometimes noted as a shrub 1-2 m. high on upland ridges), sometimes locally frequent in dense or dry forest, in forest patches in grassland, and in crest thickets, noted from near sea level to an elevation of 1,155 m. The inflorescences, associated with foliage or borne on branches and trunk, have the perianth pale yellow to bright, golden yellow; the fruits are black at maturity. Flowers and fruits have been obtained in practically all months.

TYPIFICATION: The type is *im Thurn 149* (K HOLOTYPE; ISOTYPE at BM), collected March 14, 1906, in the vicinity of Nandarivatu, Mba Province, Viti Levu.

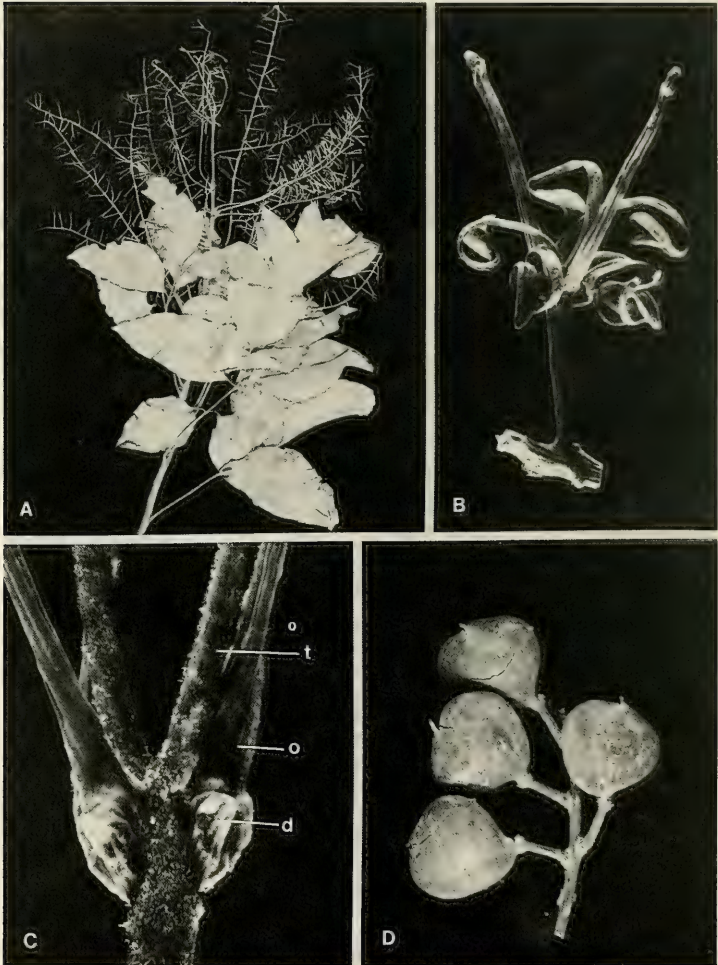


FIGURE 191. *Turrillia vitiensis*; A, distal portion of branchlet, with foliage and inflorescences, $\times 1/4$; B, paired flowers at apex of peduncle, showing recurved tepals (some fallen), anthers sessile on limbs of tepals, and straight styles, $\times 4$; C, basal portions of paired flowers at apex of peduncle, with 2 tepals (t) remaining on each flower, showing disk (d) and ovary (o), $\times 12$; D, portion of infructescence, $\times 1$. A from DA 13943, B from DA 14856, C from Stauffer & Koroiveibau 5823, D from DA 14462.

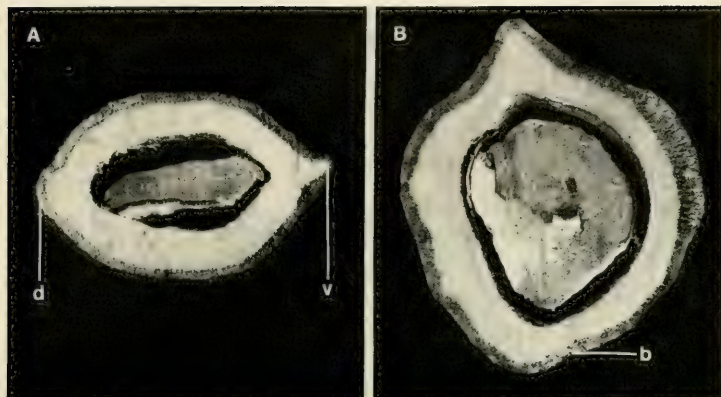


FIGURE 192. A, *Turrillia vitiensis*: cross section of fruit, showing dorsal ridge (d) and ventral ridge (v), $\times 2$. B, *Turrillia ferruginea*: longitudinal section of fruit, showing point of attachment to peduncle (b), $\times 2$. A from Gillespie 5116, B from Smith 8567.

DISTRIBUTION: Endemic to Fiji (erroneously reported from Samoa, cf. Smith and Haas, 1975, p. 146) and now known from four of the high islands. Fifty-four collections have been examined.

LOCAL NAMES AND USE: The most widely used names on Viti Levu are *kau theuti*, *kau mbuta*, and *sivia*; on Vanua Levu *kasiva* (Mathuata) and *karimba* and *kariva* (Thakaundrove) have been reported. The species is used as a timber tree.

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Mt. Mbotilamu, Mt. Evans Range, DA 14123; vicinity of Nandarivatu, DA 14462; Mt. Nanggaranambuluta, east of Nandarivatu, DA 13943. Stauffer & Koroiveibau 5823. NANDRONGA & NAVOSA: Nausori Highlands, DF 1010 (S1554/1); northern portion of Rairaimatuku Plateau, between Nandrau and Rewasau, Smith 5412. SERUA: Nathengathenga Creek, upper Navua River, DF 1011 (S1554/2); Loloma Beach, DA 16637. NAMOSI: Summit of Mt. Naitarandamu, Gillespie 5116; Nambukavesi Creek, DF 337. NAITASIRI: Mendrausuthu Range, summit of higher peak, DA 15459; Toninaiwau, Tholo-i-suva, DA 14856. KANDAVU: Vicinity of Naikorokoro, DF 1019 (S1554/4). OVALAU: Near summit of main range west of Levuka, Gillespie 4526. VANUA LEVU: MBUA: Navotuvotu, summit of Mt. Seatura, Smith 1665. MATHUATA: Mt. Ndelaikoro, DA 11488. THAKAUNDRIVE: East of Naunduna, Yanawai River, Degener & Ordenez 14120a; southern slope of Mt. Mariko, Smith 409.

2. *Turrillia ferruginea* (A. C. Sm.) A. C. Sm., comb. nov.

FIGURE 192B.

Rhamnea Seem. in *Bonplandia* 9: 255. 1861.

Rhamnea dubia Seem. Viti, 434. 1862.

Kermadecia ferruginea A. C. Sm. in *Bishop Mus. Bull.* 141: 48, fig. 21. 1936, in *Bull. Torrey Bot. Club* 70: 537. 1943, in *J. Arnold Arb.* 36: 277. 1955; J. W. Parham, *Pl. Fiji Isl.* 107. 1964, ed. 2. 153. 1972.

Bleasdalea ferruginea A. C. Sm. & J. Haas in *Amer. J. Bot.* 62: 143, fig. 36-39. 1975.

A spreading or compact tree 5-17 m. high, with a trunk to 40 cm. (or more?) in diameter, found in sometimes dense forest at elevations of 150-940 m. The perianth is ferruginous-tomentellous without and pale green within, and the fruits are black at maturity. Flowers have been obtained in August, November, and December, and fruits in scattered months throughout the year.

TYPIIFICATION: The type is *Smith 788* (BISH HOLOTYPE; many ISOTYPES), collected Dec. 18, 1933, on the western slope of Mt. Manuka, inland from Wairiki, Taveuni.

DISTRIBUTION: Endemic to Fiji and known from the three largest islands, less frequent on Viti Levu and Vanua Levu than *Turrillia vitiensis* but not infrequent on Taveuni, from which the former species remains unknown. *Seemann 84*, from Namosi Province, is apparently the earliest specimen of Proteaceae collected in Fiji.

LOCAL NAMES AND USE: Recorded local names are *kau theuti* (Serua), *sivia* (Namosi), *lienthi* (Naitasiri), and *thivea* and *kau mbuta* (Taveuni). Like *Turrillia vitiensis*, this species is considered a usable timber tree.

AVAILABLE COLLECTIONS: VITI LEVU: SERUA: Nambukelevu, upper Navua River, *DA 15656*. NAMOSI: Valley of Wainambua Creek, south of Mt. Naitarandamu, *Smith 8797*; hills bordering Wainavindrau Creek, vicinity of Wainimakutu, *Smith 8567*. NAMOSI: Vicinity of Namosi, *Seemann 84*; Mt. Voma, *DA 13963*. NAITASIRI: Rarandawai, Wainamo-Wainisavulevu divide, Wainimala Valley, *St. John 18277*; Waindrandra Creek, *DA 783*; Sawani-Serea road, *Anderson 69-40*. VANUA LEVU: MATHUATA: Mt. Ndelaikoro, *DA 12815*. TAVEUNI: Summit ridge east of Somosomo, *Gillespie 4842*; summit and adjacent slopes of Mt. Manuka, east of Wairiki, *Smith 8227*; Taveuni (?) without definite locality, *Gillespie 3201*. FIJI without further locality, *DA 796*, *Berry 96*.





FIJI ISLANDS

From the Survey of Captain H.M. Dredman, R.N. F.R.S. 1854-6.
Lieutenants W.L. Hooper and G.E. Richards, R.N.
1876-82.

and Corrections from the Works of Commodore C. Miles, C.R.N.
and various other authorities.

1. Show the depth in fathoms of ground of plain ground, 40 fms or more in extent, as noted, at mean low water.

2. Shoals are indicated in the above manner.

3. Reports of tides at 1850, determined about 1. annually.

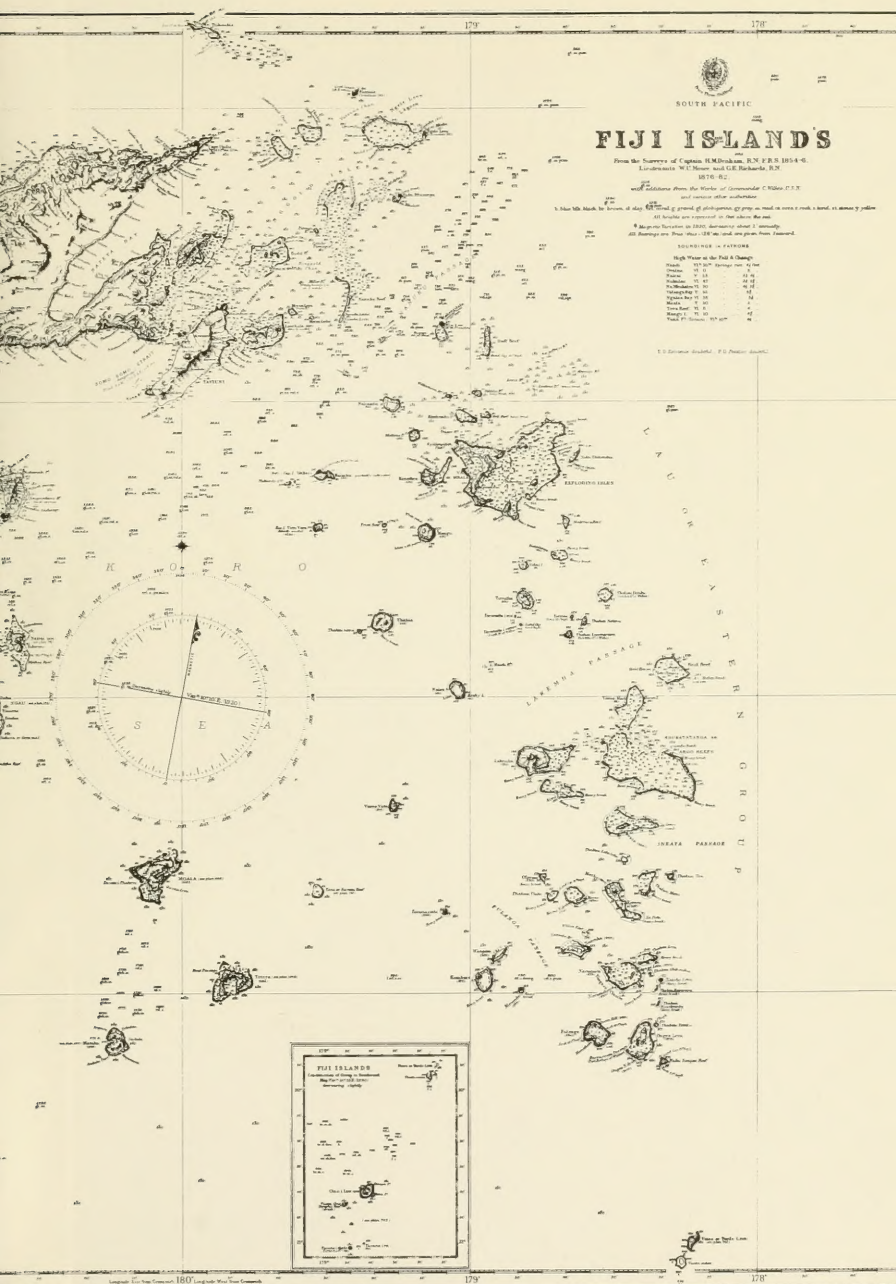
4. All bearings are true, unless otherwise stated, and are given from the leeward.

ISLANDS IN FIJIWATER

High Water at the Full & Change

Vanua Levu	10 10	Spring rise 7 1/2
Viti Levu	11 11	Spring rise 7 1/2
Malakula	12 12	Spring rise 7 1/2
Rotuma	13 13	Spring rise 7 1/2
Yasawa Is.	14 14	Spring rise 7 1/2
Yasawa Is.	15 15	Spring rise 7 1/2
Yasawa Is.	16 16	Spring rise 7 1/2
Yasawa Is.	17 17	Spring rise 7 1/2
Yasawa Is.	18 18	Spring rise 7 1/2
Yasawa Is.	19 19	Spring rise 7 1/2
Yasawa Is.	20 20	Spring rise 7 1/2
Yasawa Is.	21 21	Spring rise 7 1/2
Yasawa Is.	22 22	Spring rise 7 1/2
Yasawa Is.	23 23	Spring rise 7 1/2
Yasawa Is.	24 24	Spring rise 7 1/2
Yasawa Is.	25 25	Spring rise 7 1/2
Yasawa Is.	26 26	Spring rise 7 1/2
Yasawa Is.	27 27	Spring rise 7 1/2
Yasawa Is.	28 28	Spring rise 7 1/2
Yasawa Is.	29 29	Spring rise 7 1/2
Yasawa Is.	30 30	Spring rise 7 1/2

1. S. Distance (Statute). P. S. (Pilot) Distance.



FIJI ISLANDS
 Hydrographic Office, London
 Scale of 1:100,000
 Longitude East from Greenwich 180° Longitude West from Greenwich 175°



SOUTH PACIFIC

FIJI ISLANDS

From the Survey of Captain R. M. Schomburgk, R.N. F.R.S. 1834-6.
Lithographed by W. C. Hooper and G. E. Richards, P.R.S.
1870-82.

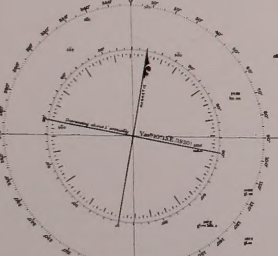
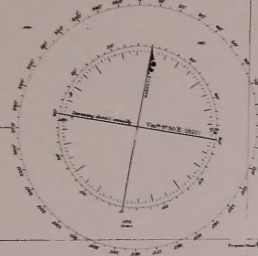
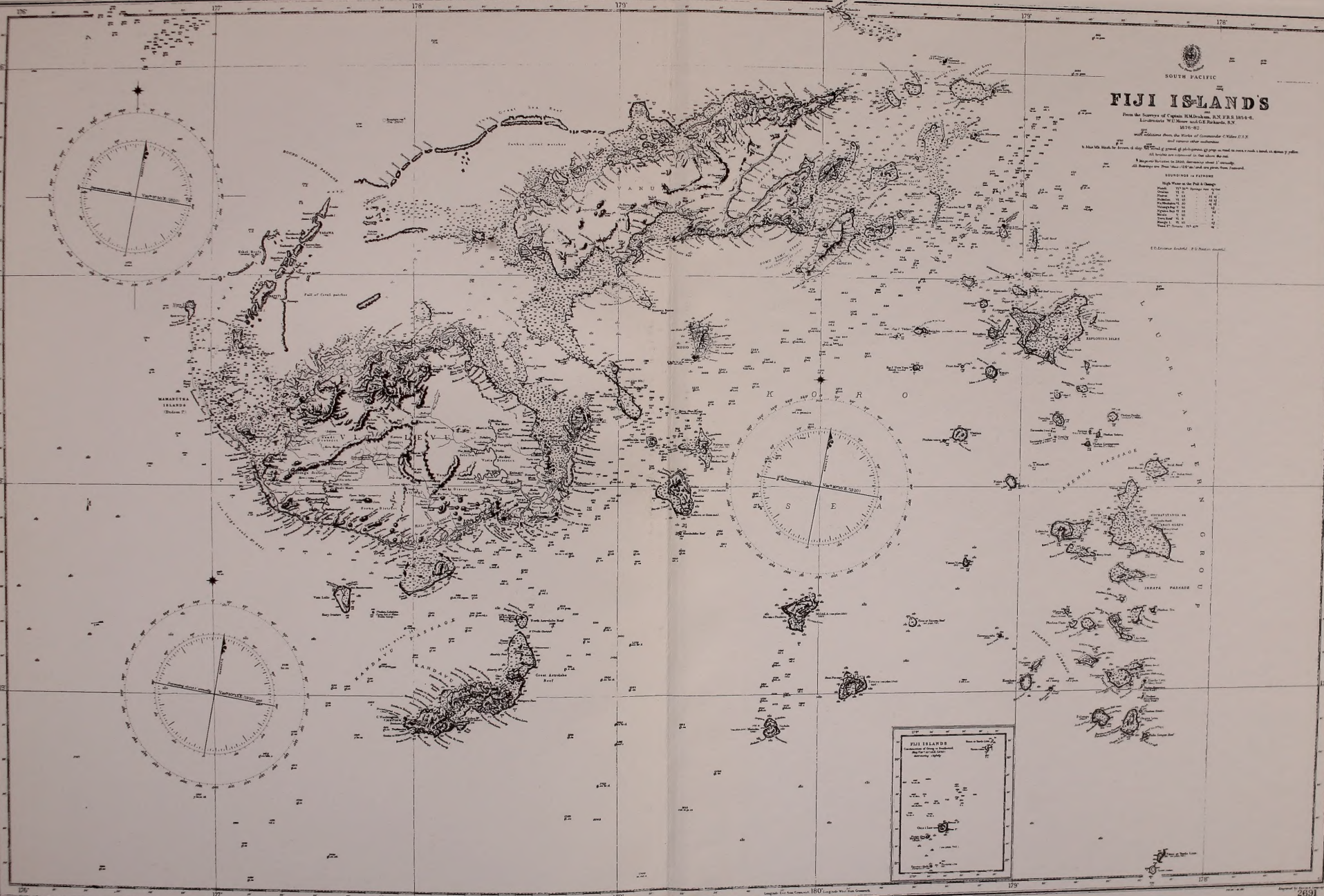
and Corrections from the Works of Commodore C. M. Kelly, R.N.,
and various other authorities.

A blue ink mark on a ship's log, or on any other paper, may be used to mark a track, or to show a place.
All bearings are given in true, unless otherwise stated.
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HEIGHTS IN FEET

Height	Feet
100	30
200	60
300	90
400	120
500	150
600	180
700	210
800	240
900	270
1000	300
1100	330
1200	360
1300	390
1400	420
1500	450
1600	480
1700	510
1800	540
1900	570
2000	600
2100	630
2200	660
2300	690
2400	720
2500	750
2600	780
2700	810
2800	840
2900	870
3000	900
3100	930
3200	960
3300	990
3400	1020
3500	1050
3600	1080
3700	1110
3800	1140
3900	1170
4000	1200
4100	1230
4200	1260
4300	1290
4400	1320
4500	1350
4600	1380
4700	1410
4800	1440
4900	1470
5000	1500

E. D. Johnston, Author. J. P. Nicholson, Lithographer.





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